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NATIONAL DAM INSPECTION PROGRAM. WILD ACRES LAKE DAM (NDI I.D. --ETC(U)

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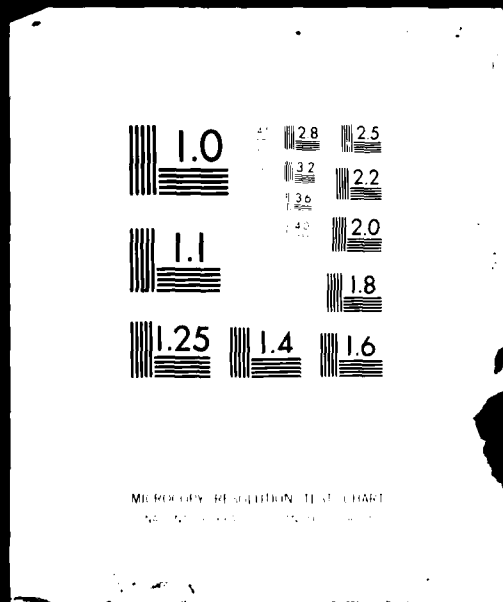
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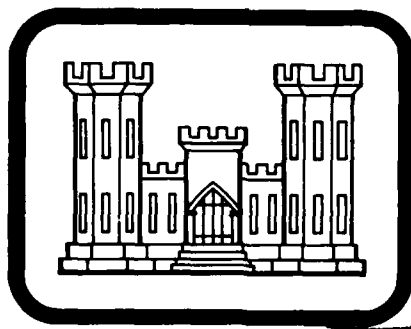
PENNSYLVANIA

WILD ACRES LAKE DAM

(NDI I.D. NO. PA-00407,
PENNDER I.D. NO. 52-65)

MARCON, INC.

PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM



PREPARED FOR *Brigadier General M. J. H. H. H.*

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(15) DACW 31-81-C-0015

PREPARED BY

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Wild Acres Lake Dam: NDI I.D. No. PA-00407

Owner: Marcon, Inc.
State Located: Pennsylvania (PennDER I.D. No. 52-65)
County Located: Pike
Stream: Branch of Hornbecks Creek
Inspection Date: 15 October 1980
Inspection Team: GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and hydrologic/hydraulic analysis, the dam is considered to be in fair condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 10 percent of the PMF prior to embankment overtopping. The analysis also showed that should a 0.25 PMF or larger event occur, all three dams at South Pond, North Lake and Wild Acres Lake would be overtopped. South Pond Dam and Wild Acres Lake Dam could possibly fail (North Lake Dam is considered capable of withstanding the overtopping flows produced by a 1/2 PMF flood event), resulting in property damage and possibly loss of life in the downstream region. Thus, based on the screening criteria contained in the recommended guidelines, the spillway at Wild Acres Lake Dam is considered to be seriously inadequate and the facility unsafe, non-emergency.

It is recommended that the owner immediately:

a. Retain the services of a registered professional engineer experienced in the hydraulics and hydrology of dams to more accurately assess the adequacy of the spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

Wild Acres Lake Dam: NDI I.D. No. PA-00407

b. Develop a formal emergency warning system to notify downstream residents should hazardous embankment conditions develop. Included in the plan should be provisions for around the clock surveillance of the facility during periods of unusually heavy precipitation.

c. Repair the deteriorated concrete associated with the spillway, especially its wingwalls.

d. Restore or replace the present outlet works in order to provide an operable means of draining the reservoir.

e. Continue to observe in all future inspections the seepage and drainage encountered along the spillway discharge channel sidewalls noting any turbidity and/or changes in rates of flow. In addition, excess vegetation along the sidewalls should be removed and controlled in order to provide unobstructed views of these areas.

f. Provide adequate rock slope protection along the bare areas on both the upstream and downstream embankment faces immediately adjacent the spillway right wingwall.

g. Remove and control excess vegetation from the embankment crest and slopes as part of a regular maintenance program.

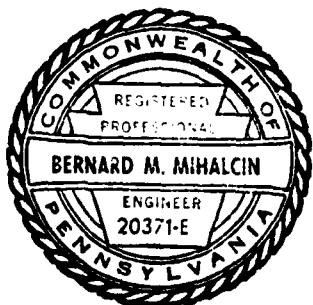
h. Develop formal manuals of operation and maintenance to ensure the future proper care of the facility.

GAI Consultants, Inc.

Approved by:

Bernard M. Mihalcin
Bernard M. Mihalcin, P.E.

James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer



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OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
WILD ACRES LAKE DAM
NDI# PA-00407, PENNDA# 52-65

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Wild Acres Lake Dam is a zoned earth and rockfill embankment constructed with a 2-foot thick concrete corewall along its centerline. The structure is approximately nine feet high and 420 feet long, including spillway. Adjacent the embankment at its right end is a small earthen dike less than two feet high. The dike spans a natural low area at the right abutment and is about 100 feet long. The total combined length of the embankment, spillway and dike is about 520 feet. The facility is constructed with an uncontrolled, concrete-gravity spillway weir section located near the center of the main embankment. The spillway has a rectangular shaped overflow opening 45 feet long. The outlet works consists of two 12-inch diameter cast iron pipes that discharge at the base of the spillway, one located adjacent to each wingwall. Both conduits are currently nonfunctional.

b. Location. Wild Acres Lake Dam is located on a branch of Hornbecks Creek in Delaware Township, Pike County, Pennsylvania. The facility is an integral part of the surrounding development known as Wild Acres. The community is nestled in the mountains of Pike County less than five miles west of U. S. Route 209 which parallels the Delaware River in this area. The dam, reservoir and watershed are contained within the Lake Maskenozha, Pennsylvania - New Jersey, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N41°13.2' and W74°54.9'.

c. Size Classification. Small (9 feet high, 276 acre-feet storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Marcon, Inc.
155 Willowbrook Boulevard
P. O. Box 460
Wayne, New Jersey 07470
Attn: Joseph J. Marone
Vice President

f. Purpose. Recreation.

g. Historical Data. Information contained in PennDER files indicates that Wild Acres Lake Dam, formerly known as Kiel Lake Dam, was constructed in 1928. The facility was originally financed and owned by August Kiel, president of Tompkins-Kiel Marble Company of New York, New York. The dam was constructed on the site of an old timber dam known as Sanderson Dam which was built around 1904. August Kiel owned the facility until his death in 1945. His widow deeded the property in September 1945 to Michael DeLassio who, 20 years later, transferred ownership of the property to his son Michael DeLassio, Jr., in July 1965. The present owner, Marcon, Inc., acquired the facility and surrounding properties on August 1, 1967 and renamed the embankment Wild Acres Lake Dam.

Records of seven state inspections performed between 1928 and 1965 are contained in PennDER files. They indicate the facility had been adequately maintained and in good condition for its first 37 years of existence (1928-1965). Several inches of settlement measured across the crest and minor overgrowth were the only deficiencies ever cited. No records of state inspections since 1965 are available.

The existing facility appears as depicted in a 1927 drawing contained in PennDER files and apparently has never been modified.

1.3 Pertinent Data.

a. Drainage Area (square miles). 1.9

b. Discharge at Dam Site.

Discharge Capacity of Outlet Conduits - Discharge curves are not available.

Discharge Capacity of Spillway at Maximum Pool = 210 cfs (see Appendix D, Summary Input/Output Sheets, Sheet J).

c. Elevations (feet above mean sea level). The following elevations were obtained from available drawings and through field measurements based on the approximate elevation of normal pool at 1095.0 feet as estimated from Figure 1, Appendix E (also see Appendix D, Sheet 1).

Top of Dam	1096.5 (design).
	1096.3 (field).
Maximum Design Pool	Not known.
Maximum Pool of Record	Not known.
Normal Pool	1095.0 (assumed datum).
Spillway Crest	1095.0
Upstream Inlet Invert	1087.0 (design).
Downstream Outlet Invert	1087.0 (design).
	1087.1 (field).
Streambed at Dam Centerline	1087.0 (estimated).

d. Reservoir Length (feet).

Top of Dam	1000
Normal Pool	850

e. Storage (acre-feet).

Top of Dam	276
Normal Pool	166

f. Reservoir Surface (acres).

Top of Dam	86
Normal Pool	82

g. Dam.

Type	Earth-rockfill.
Length	375 feet (excluding spillway and dike).
Height	Nine feet (field measured; embankment crest to base of spillway).
Top Width	Ten feet (design). Six to seven feet (varies; field).
Upstream Slope	2H:1V
Downstream Slope	2H:1V
Zoning	Concrete corewall along embankment centerline supported on both sides with earthfill covered with dumped rockfill outer shells.

Impervious Core	Concrete corewall two feet thick along embankment centerline.
Cutoff	Corewall reportedly extends several feet into the embankment foundation effectively acting as a cutoff.
Grout Curtain	None indicated.
h. <u>Appurtenant Dikes and Saddle Dams.</u>	
Type	Earth.
Location	Right abutment.
Height	Less than two feet.
Length	Approximately 100 feet
Internal Features	Not known. Assumed to be homogeneous earth.
i. <u>Diversion Canal and Regulating Tunnels.</u>	
j. <u>Spillway.</u>	
Type	Uncontrolled, concrete-gravity weir section located near the center of the main embankment.
Crest Elevation	1095.0 feet.
Crest Length	45 feet.
k. <u>Outlet Works.</u>	
Type	Two 12-inch diameter cast iron pipes, one located adjacent to each wingwall at base of the spillway.
Length	Eight feet (right outlet). Eleven feet (left outlet).

Closure and
Regulating Facilities

Both conduits are presently nonfunctional. Design drawings indicate 12-inch diameter valves located at the inlets.

Access

Presently, the valves are accessible by diver only. If stems were attached the valves would then be accessible from atop the spillway bridge.

SECTION 2 ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No design reports, calculations, or formal design data are available. PennDER files contain correspondence and photographs dating back to 1927 that provide information relative to the general history of the facility. These files contain a brief two page report, dated 1927, that was issued by the state prior to the granting of a construction permit. This report presents brief descriptions of the most relevant design aspects of the facility. Two drawings are also available, one of which supercedes the other and is included in Appendix E (see Figure 2).

b. Design Features.

1. Embankment. Pertinent design features of the embankment are presented in Figure 2. As indicated, the embankment is a zoned earth and rockfill structure with a 2-foot thick concrete corewall along its centerline. The corewall is reportedly founded on "tough blue clay" and backed on both sides with compacted earthfill over which is placed a layer of rockfill. Both the upstream and downstream embankment faces are sloped at 2H:1V. The design embankment crest width is ten feet; however, field measurements indicate it to vary from six to seven feet.

The embankment is constructed with a small earth dike at its right end. The dike is less than two feet high and about 100 feet long. It serves to provide freeboard to a locally low area along the right abutment. The dike is separated from the embankment by a small knoll. Figure 2 indicates the embankment corewall extends through the knoll and into the dike; thus, tying the two structures together. Visual inspection, however, indicates that the corewall extends the entire length of the dike and into the right abutment. The top of the corewall is exposed along its entire length except at the knoll and at both abutments.

2. Appurtenant Structures.

a) Spillway. The spillway plan and cross-section are depicted in Figure 2. As indicated, the spillway is an uncontrolled, concrete-gravity weir structure located near the center of the main embankment. The section has a vertical upstream face and a stepped downstream face. It is two feet wide at the top and 7.5 feet wide at its base. Flows are regulated by a inclined-crested weir, 45 feet long.

b) Outlet Works. Wild Acres Lake Dam was originally constructed with an outlet works consisting of two 12-inch diameter cast iron pipes located at the base of the spillway adjacent to both wingwalls (note: Figure 2 incorrectly shows only one outlet). Neither outlet is currently functional; however, both were originally equipped with 12-inch diameter gate valves located at the inlets that were manually controlled from the bridge across the spillway. The inlets are located at the bases of concrete valve chambers that abut the upstream spillway face (see Figure 2).

c. Specific Design Data and Criteria. No formal design data or information relative to design procedures are available.

2.2 Construction Records.

No construction records are available.

2.3 Operational Records.

No records of the present day-to-day operation of the facility are maintained.

2.4 Other Investigations.

No formal investigations other than infrequent state inspections have been performed on this facility subsequent to its construction.

2.5 Evaluation.

The available data are considered sufficient to make a reasonable Phase I evaluation of the facility.

SECTION 3 VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests the dam and its appurtenances are in fair condition.

b. Embankment. Observations made during the visual inspection indicate the embankment and adjacent dike are in good condition. Heavy brush growth and small trees were observed along the embankment crest and upstream face (see Photographs 1 and 3). No evidence of seepage through the downstream embankment face, excess settlement, sloughing, erosion or animal burrows was encountered by the inspection team. Some rock slope protection has been displaced immediately adjacent the spillway right wingwall, leaving small bare areas on both the upstream and downstream embankment faces. The top of the concrete corewall exhibits excessive cracking and spalling along its entire length except for that portion associated with the dike along the right abutment which is in relatively good condition (see Photograph 2). ←

The only flows observed by the inspection team were encountered along both sidewalls of the spillway discharge channel within 15 feet of the downstream embankment toe. Flow beneath the rocks and weeds along the right sidewall was estimated at two to three gallons per minute (gpm). Two 3/4-inch diameter pipes protrude from the left sidewall. The nature of the pipes is not known and is not indicated in Figure 2. One pipe was flowing full at about five to six gpm. An additional three to four gpm was observed seeping from the sidewall beneath the pipes. The flows on both sides of the channel were clear.

c. Appurtenant Structures.

1. Spillway. The visual inspection revealed the spillway is in fair condition. Excessive concrete deterioration is evident throughout the structure, particularly at the wingwalls. Both wingwalls are extensively spalled and cracked (see Photographs 5, 6 and 7). The condition of the main gravity section, including the crest and downstream face, is good relative to the wingwalls; however, general deterioration is apparent.

2. Outlet Works. The outlet conduits are dilapidated and currently nonfunctional. The risers along the upstream spillway face are flooded and at least partially filled with debris. Gate valve stems are not in evidence.

d. Reservoir Area. The Wild Acres Lake Dam watershed consists of moderate to steep, heavily wooded slopes. The general area surrounding the reservoir has been substantially developed with numerous permanent and seasonal dwellings. The developer

is still active and future community expansion is likely. Thus, the current complex of the watershed is considered temporary.

Two smaller reservoirs are located within the Wild Acres Lake Dam watershed. These are known as North Lake Dam and South Pond Dam and are indicated in Figure 1. North Lake Dam is an 18-foot high earth embankment about 730 feet long (Phase I Inspection Report, National Dam Inspection Program, North Lake Dam, NDI I. D. No. PA-00268, prepared by GAI Consultants, Inc., dated January 1981). South Pond Dam is a 13-foot high earth embankment about 268 feet long (Phase I Inspection Report, National Dam Inspection Program, South Pond Dam, NDI I.D. No. PA-00639, prepared by GAI Consultants, Inc., dated January 1981). Both dams are serviced by trapezoidal shaped, earth and rock cut spillways. The individual and cumulative effects of each facility upon the evaluation of Wild Acres Lake Dam are presented in Section 5.5.b.

e. Downstream Channel. Discharge from Wild Acres Lake Dam flows through a steep, narrow and heavily forested valley with steep confining slopes. The first inhabitable structures situated near the streambed are located approximately 9,000 feet downstream of the dam at Camp Log-N-Twig, a seasonal recreation camp. The camp was not in use on the day of the inspection. The structures located near the stream apparently include sleeping and dining facilities, etc. A rough estimate of the number of inhabitants of the facility during the peak season is difficult, but, can be reasonably assumed to be more than a few (three) and as many as several hundred. Thus, based on the high potential for loss of life and property damage, the hazard classification is considered to be high.

It is noted that the dam shown in Figure 1 located about 5900 feet downstream of Wild Acres Lake Dam was also observed by the field team on the day of the inspection. The facility was found to be drained and in the process of being extensively renovated. The dam appears to be primarily an earthen structure with a concrete spillway section near its centerline. No work was currently being performed at the site. As the owner is unknown and no records or drawings of the completed facility are available from PennDER files, it has not been included in the analysis contained in this report. However, its status should be reevaluated in any future hydrologic and hydraulic assessments of Wild Acres Lake Dam.

3.2 Evaluation.

The overall condition of the facility based on visual observations is considered to be fair. Deficiencies requiring remedial attention include: 1) restoration or replacement of the existing outlet works; 2) repairing extensive spillway concrete deterioration; and 3) clearing excess overgrowth from the embankment crest and upstream slope.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

Wild Acres Lake Dam is essentially a self-regulating facility. That is, excess inflows are automatically discharged through the uncontrolled spillway. The outlet conduits are not operated and are currently nonfunctional. No formal operations manual is available.

4.2 Maintenance of Dam.

The facility is reportedly maintained on an unscheduled basis by the owner's maintenance staff. No formal maintenance program has been established at this facility and no formal maintenance manuals are available.

4.3 Maintenance of Operating Facilities.

The outlet works at Wild Acres Lake Dam are currently non-functional. In their present condition, extensive restoration or complete replacement is required.

4.4 Warning System.

No formal warning system is presently in effect.

4.5 Evaluation.

The general appearance of the facility indicates a lack of adequate maintenance. No formal maintenance manuals are available, but, are recommended to ensure the future proper care of the facility. In addition, formal warning system procedures should be included in these manuals to provide for the protection of downstream residents should hazardous embankment conditions develop.

SECTION 5 HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design data, calculations, or design reports are available. The original state construction permit report, dated 1927, indicates that the watershed was thought to be 0.47 square miles which is substantially in error. The actual watershed area based on U.S.G.S. mapping is about 1.9 square miles.

5.2 Experience Data.

Daily records of reservoir levels and/or spillway discharges are not available.

5.3 Visual Observations.

Visual observations revealed excessive deterioration associated with the spillway concrete. The present condition of the structure is not expected to adversely affect the operation of the spillway during a flood event. However, continued decay could hasten structural instability, particularly under the increased stress concurrent with high flows.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U. S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Wild Acres Lake Dam ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. This classification is based on the relative size of the dam (small) and the potential hazard of dam failure to downstream developments (high). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF.

b. Results of Analysis. Wild Acres Lake Dam was evaluated under normal operating conditions. That is, the reservoir was initially at its normal pool or spillway elevation of 1095.0 feet, with the spillway weir discharging freely. The outlet conduits were assumed to be nonfunctional for the purpose of analysis, since the total flow capacity of the conduits is not such that it would significantly increase the total discharge capabilities of the dam and reservoir. The spillway consists of a concrete-gravity free overfall weir structure, with an inclined crest and a step-like downstream face (see Appendix D, Sheet 6 and Photographs 5, 6 and 7).

South Pond Dam and North Lake Dam, located immediately upstream of Wild Acres Lake, were also evaluated in this analysis to determine their effects on Wild Acres Lake Dam. They also were evaluated under normal operating conditions. That is, the reservoirs were initially at normal pool; the spillways were assumed to be discharging freely; and, the outlet conduits were assumed to be closed. Outflows from these facilities were routed directly into Wild Acres Lake. All pertinent engineering calculations relative to the evaluation of Wild Acres Lake Dam, including those pertaining to the upstream facilities, are included in Appendix D.

Overtopping analysis (using the modified HEC-1 computer program) indicated that the discharge/storage capacity of Wild Acres Lake Dam can accommodate only about 10 percent of the PMF prior to embankment overtopping, while North Lake Dam and South Pond Dam can accommodate only about 24 percent and 20 percent of the PMF, respectively, prior to embankment overtopping. Under PMF conditions, the low top of embankment at Wild Acres Lake Dam was overtopped for more than 12 hours, by depths of up to 2.3 feet. Under the 1/2 PMF (SDF) event, the low top of dam was inundated for more than 10 hours by a maximum depth of about 1.5 feet (Appendix D, Summary Input/Output Sheets, Sheet J). Since the SDF for Wild Acres Lake Dam is the 1/2 PMF, it can be concluded that the dam has a high potential for overtopping, and thus, for breaching under floods of less than SDF magnitude.

Since Wild Acres Lake Dam cannot safely pass a flood of at least 1/2 PMF magnitude, the possibility of embankment failure under floods of less than 1/2 PMF intensity was investigated (in accordance with Corps directive ETL-110-2-234). In addition, since South Pond Dam can accommodate only about 20 percent of the PMF prior to overtopping, the possibility of its failure was also investigated. Finally, although the spillway at North Lake Dam could accommodate only about 24 percent of the PMF, the possibility of its failure was not investigated since it was considered structurally capable of withstanding the overtopping flows associated with a flood of 1/2 PMF intensity.

Several possible alternative failure schemes were examined for Wild Acres Lake Dam and South Pond Dam, since it is difficult, if

not impossible, to determine exactly how or if a specific dam will fail. The major concern of the breaching analysis is with the impact of the various breach discharges on increasing downstream water surface elevations above those to be expected if breaching did not occur.

The modified HEC-1 computer program was used for the breaching analysis with the assumption that the breaching of an earth dam would begin once the water level in the reservoir reached the low top of dam elevation. Also, the channel bed was assumed to be initially dry for the routing of the outflows downstream.

Five possible modes of failure were investigated for each of the two dams to be failed. Two sets of breach geometry were evaluated for each of two failure times (Appendix D, Sheet 13). The two sets of breach sections chosen were considered to be the minimum and maximum probable failure sections. The two failure times (total time for each breach section to reach its final dimensions), under which the minimum and maximum sections were investigated were assumed to be a rapid time (0.5 hours) and a prolonged time (3.0 hours), so that a range of this most sensitive variable might be examined. In addition, an average possible set of breach conditions was analyzed with a failure time of 1.0 hours.

The five failure plans described were analyzed under 0.25 PMF conditions to ensure overtopping of both Wild Acres Lake Dam and South Pond Dam. In all cases, the breaching of the downstream Wild Acres Lake Dam began about 30 minutes ahead of the failure of the upstream South Pond Dam (Appendix D, Sheet 15).

The peak breach outflows (resulting from 0.25 PMF conditions) at Wild Acres Lake Dam ranged from about 1,500 cfs for the minimum section-maximum fail time scheme to about 9,080 cfs for the maximum section-minimum fail time scheme. The peak outflow from the average breach scheme was about 2,870 cfs, compared to the non-breach 0.25 PMF peak outflow of approximately 960 cfs (Summary Input/Output Sheets, Sheet S).

The principal center of damage investigated is located at Camp Log-N-Twig along the banks of Hornbecks Creek, approximately 1.7 miles downstream from Wild Acres Lake Dam (Section 2, see Figure 1). Within this reach, the 0.25 PMF non-breach outflows remained within the banks of the stream. However, the water surface elevations resulting from the breach models were as much as 5.2 feet above the non-breach levels, and in all cases, above the damage levels of the nearby structures (Appendix D, Sheet 16). These conditions resulted from the combination of the failures of both South Pond Dam and Wild Acres Lake Dam. However, the breach analysis also indicates that the failure of Wild Acres Lake Dam alone would have similar results.

The consequences of dam failure can better be envisioned if not only the increase in the height of the floodwave is considered, but, also the great increase in momentum of the larger and probably

swifter moving volume of water. In addition, the possibility of a near instantaneous failure due to the collapse of the concrete corewall was not considered in this analysis, although such a failure is possible and would most likely result in higher downstream water surface elevations. Therefore, it is concluded that the failure of Wild Acres Lake Dam is quite possible, and would most likely lead to increased property damage and possibly loss of life in the downstream regions.

5.6 Spillway Adequacy.

As presented previously, Wild Acres Lake Dam can accommodate only about 10 percent of the PMF prior to embankment overtopping. In addition, the upstream South Pond Dam and North Lake Dam can safely accommodate only about 20 and 24 percent of the PMF, respectively. It has been shown that should a 0.25 PMF or larger event occur, all three dams at South Pond, North Lake, and Wild Acres Lake would be overtopped. South Pond Dam and Wild Acres Lake Dam could possibly fail, the combination of which would result in property damage and possibly loss of life in the downstream region. The failure of Wild Acres Lake Dam alone would have similar results. Therefore, the spillway at Wild Acres Lake Dam is considered to be seriously inadequate.

SECTION 6 EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment and adjoining earth dike are considered to be in good structural condition. General lack of maintenance has resulted in minor deficiencies requiring remedial attention. Excess vegetation which covers the embankment crest and upstream slope, should be cut back regularly and kept from becoming deeply rooted, whereby, it could eventually damage the structure. The bare areas observed along both slopes adjacent the spillway right wingwall should be covered with durable rock slope protection to prevent possible erosion. The seepage and drainage encountered along the discharge channel sidewalls should continue to be observed in all future inspections, noting any turbidity and/or changes in rates of flow. Excess vegetation along the channel sidewalls should be kept trimmed so that a clear view of these flows can be maintained.

b. Appurtenant Structures.

1. Spillway. The spillway is considered to be in fair condition. The excessive surficial deterioration observed by the inspection team does not appear to threaten the integrity of the structure, presently. However, it can be assumed that continued decay could lead to structural instability particularly during periods of high flows and increased structural stress.

2. Outlet Works. The outlet conduits are nonfunctional and, thus, in poor condition. The restoration or replacement of this system is necessary in order to provide an operable means of draining the reservoir.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction.

6.3 Past Performance.

Available information indicates the facility has performed satisfactorily throughout its 52 year history. The facility has been formally inspected seven times since 1928 and was consistently reported as being in good condition. No incidences of overtopping have been recorded.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. As the facility appears well constructed and statically stable, it is believed that it can withstand the expected dynamic forces; however, no calculations and/or investigations were performed to confirm this belief.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this evaluation indicate the facility is in fair condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility will pass and/or store only about 10 percent of the PMF prior to embankment overtopping. In addition, the upstream South Pond Dam and North Lake Dam can safely accommodate only about 20 and 24 percent of the PMF, respectively. It has been shown that should a 0.25 PMF or larger event occur, all three dams at South Pond, North Lake and Wild Acres Lake would be overtopped. South Pond Dam and Wild Acres Lake Dam could possibly fail (North Lake Dam is considered to be structurally capable of withstanding the overtopping flows produced by a 1/2 PMF flood event), resulting in property damage and possibly loss of life in the downstream region. Therefore, the spillway at Wild Acres Lake Dam is considered to be seriously inadequate and the facility unsafe, non-emergency.

b. Adequacy of Information. The available data are considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The following recommendations should be implemented immediately.

d. Necessity for Additional Investigations. Additional hydrologic/hydraulic investigations are considered necessary to more accurately assess the adequacy of the spillway.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Retain the services of a registered professional engineer experienced in the hydraulics and hydrology of dams to more accurately assess the adequacy of the spillway and prepare recommendations for remedial measures deemed necessary to make the facility hydraulically adequate.

b. Develop a formal emergency warning system to notify downstream residents should hazardous embankment conditions develop. Included in the plan should be provisions for around the

clock surveillance of the facility during periods of unusually heavy precipitation.

c. Repair the deteriorated concrete associated with the spillway, especially its wingwalls.

d. Restore or replace the present outlet works in order to provide an operable means of draining the reservoir.

e. Continue to observe the seepage and drainage encountered along the spillway discharge channel sidewalls in all future inspections noting any turbidity and/or changes in rate of flow. In addition, excess vegetation along the sidewalls should be removed and controlled in order to provide unobstructed views of these areas.

f. Provide adequate rock slope protection along the bare areas on both the upstream and downstream embankment faces immediately adjacent the spillway right wingwall.

g. Remove and control excess vegetation from the embankment crest and slope as part of a regular maintenance program.

h. Develop formal manuals of operation and maintenance to ensure the future proper care of the facility.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST VISUAL INSPECTION PHASE 1

NAME OF DAM Wild Acres Lake Dam STATE Pennsylvania COUNTY Pike

NDI # PA — 00407 PENNDER # 52-65

TYPE OF DAM Earth-Rockfill SIZE Small HAZARD CATEGORY High

DATE(S) INSPECTION 15 October 1980 WEATHER Overcast TEMPERATURE 50° @ Noon

POOL ELEVATION AT TIME OF INSPECTION 1094.8 feet M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL

B. M. Mihalcin

D. J. Spaeder

D. L. Bonk

OWNER REPRESENTATIVES

Monroe Engineering

Leonard Tusar - General Mgr.

OTHERS

PennDER

James A. Griffiths

RECORDED BY B. M. Mihalcin

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00407
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - good. Vertical - good (see "Profile of Dam Crest", Appendix A).	
RIPRAP FAILURES	Upstream and downstream embankment faces are covered with durable, well graded, sandstone. Some riprap has been displaced along a 15-foot wide area located adjacent the right spillway wingwall leaving a portion of the upstream face exposed.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.	

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	ND# PA. 00407
DAMP AREAS IRREGULAR VEGETA- TION (LUSH OR DEAD PLANTS)	None observed.	
ANY NOTICEABLE SEEPAGE	None observed through downstream embankment face. Flow was observed beneath the rocks and weeds on both sides of the channel about 20 feet downstream of the spillway crest. Possibly a discharging toe drain or perhaps seepage. Flow at right \approx 2 to 3 gpm. Flow at left \approx 8 to 10 gpm.	
STAFF GAGE AND RECORDER	None.	
DRAINS	Two 3/4-inch diameter pipes protrude through left side of discharge channel downstream of spillway. One flowing full \approx 5 to 6 gpm. Possibly toe drains or old water supply pipes. Some drainage observed beneath pipes. Total flow \approx 8 to 10 gpm.	
MISCELLANEOUS	Exposed top of concrete corewall is severely deteriorated, cracked and spalled. Other than providing local low spots, the condition of the corewall appears to present no problems. Small trees and brush cover portions of the crest obscuring the corewall.	

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00407
INTAKE STRUCTURE	Small concrete riser structures about the upstream face of the spillway adjacent each wingwall. Both risers are flooded. In addition, large rocks could be seen in the right riser. No valves, stems or portions of the valve mechanisms are visible.	
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	12-inch diameter cast iron pipes, one adjacent to each wingwall. Left pipe extends about three feet beyond the base of the spillway and is clearly visible. Right pipe has apparently been broken off and does not extend beyond the base of the spillway.	
OUTLET STRUCTURE	None.	
OUTLET CHANNEL	Both pipes discharge into spillway discharge channel at base of spillway structure.	
GATE(S) AND OPERATIONAL EQUIPMENT	Both pipes are non-functional. No operating equipment was observed.	

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDM PA · 00407
TYPE AND CONDITION	Uncontrolled, rectangular, concrete spillway with an inclined-crested weir and stepped downstream face. Fair condition. Excessive concrete deterioration observed; however, structure appears to be stable.	
APPROACH CHANNEL	N/A.	
SPILLWAY CHANNEL AND SIDEWALLS	Two-foot thickn cyclopean concrete sidewalls in poor condition. Excessive spalling and cracking observed. Concrete downstream face of the spillway is chipped and cracked. Flows are discharged immediately into a trapezoidal shaped, rock lined channel.	
STILLING BASIN PLUNGE POOL	Discharges into a trapezoidal shaped, rock lined channel.	
DISCHARGE CHANNEL	Rock lined channel constricted as it approaches bridge about 70 feet downstream of spillway crest.	
BRIDGE AND PIERS EMERGENCY GATES	Small deteriorated wood plank foot bridge spans spillway crest. Two small piers support bridge. Pins for flashboards are visibly protruding the crest. Small wood plank roadway bridge with concrete abutments spans channel about 70 feet downstream of the spillway.	

SERVICE SPILLWAY

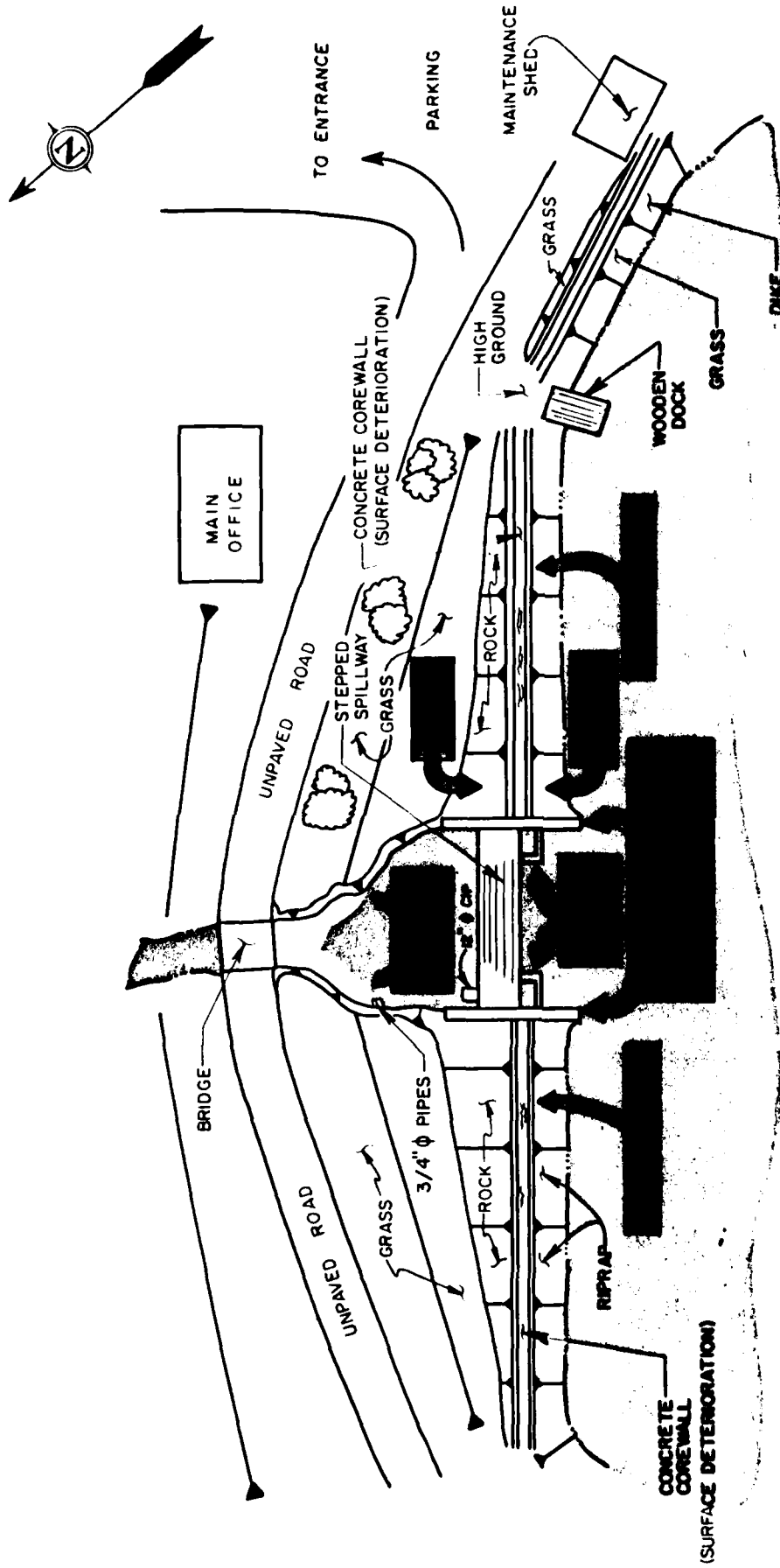
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00407
TYPE AND CONDITION	N/A	
APPROACH CHANNEL	N/A	
OUTLET STRUCTURE	N/A	
DISCHARGE CHANNEL	N/A	

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	NDI# PA - 00407
MONUMENTATION SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHERS	None.	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

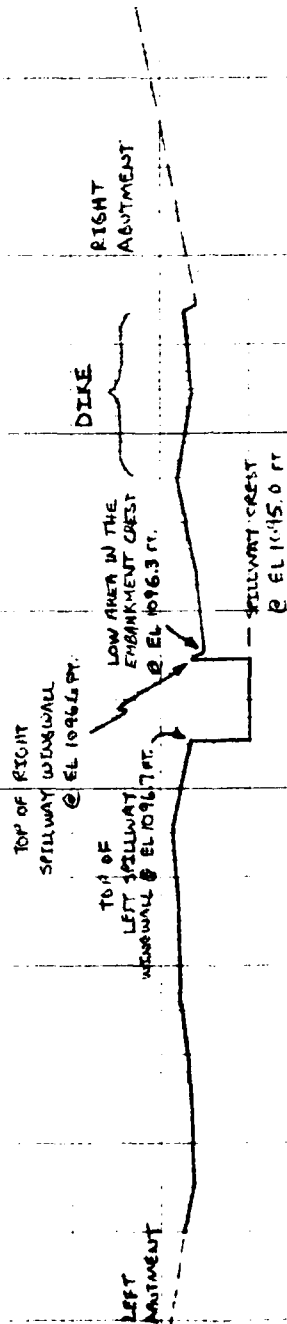
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS	ND# PA . 00407
SLOPES: RESERVOIR	Gentle to moderate, heavily forested slopes. No signs of slope distress were observed.	
SEDIMENTATION	None observed.	
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Small woodplank roadway bridge supported on concrete piers spans the discharge channel less than 100 feet downstream of the embankment.	
SLOPES: CHANNEL VALLEY	Discharge from Wild Acres Lake Dam flows through a steep, narrow and heavily forested valley with steep confining slopes.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Camp Log-N-Twig, seasonal recreational camp, is located along the banks of the channel about 9,000 feet downstream of the dam. It is estimated that the camp likely houses as many as several hundred persons during its peak season.	



WILD ACRES LAKE DAM
GENERAL PLAN - FIELD INSPECTION NOTES

WILD ACRES LAKE DAM

PROFILE OF DAM CREST
FROM FIELD SURVEY



SCALE: VERTICAL $\frac{1"}{40'}$
HORIZONTAL $\frac{1"}{400'}$

APPENDIX B
ENGINEERING DATA CHECKLIST

**CHECK LIST
ENGINEERING DATA
PHASE I**

NAME OF DAM Wild Acres Lake Dam

ITEM	REMARKS	NDI# PA - 00407
PERSONS INTERVIEWED AND TITLE	Monroe Engineering, Inc. (subsidiary of Marcon, Inc.). Leonard Tusar - General Manager.	
REGIONAL VICINITY MAP	See Figure 1, Appendix E.	
CONSTRUCTION HISTORY	Originally known as Kiel Lake Dam, the facility was constructed in 1928. See Section 1.2.g of report for history of dam.	
AVAILABLE DRAWINGS	Two drawings available in PennDER files; however, one supercedes the other. See Figure 2, Appendix E.	
TYPICAL DAM SECTIONS	See Figure 2, Appendix E.	
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	See Figure 2, Appendix E. Discharge rating curve not available.	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDIN PA . 00407
SPILLWAY: PLAN SECTION DETAILS	See Figure 2, Appendix E.	
OPERATING EQUIP- MENT PLANS AND DETAILS	See Figure 2, Appendix E. Additional pond drain added to right side of spillway during original dam construction. Both conduits are presently considered to be inoperable.	
DESIGN REPORTS	None available.	
GEOLOGY REPORTS	None available.	
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	Formal design computations are not available; however, correspondence in Penndel files indicates the spillway capacity to be 282 cfs with a watershed area of 0.47 square miles (actual watershed is 1.9 square miles).	
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	Foundation material indicated on Figure 2, Appendix E. Other boring or testing information not available.	

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDI# PA -	00407
BORROW SOURCES	Not known.		
POST CONSTRUCTION DAM SURVEYS	None.		
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.		
HIGH POOL RECORDS	No formal records are available.		
MONITORING SYSTEMS	None.		
MODIFICATIONS	None.		

**CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)**

ITEM	REMARKS	NDI# PA - 00407
PRIOR ACCIDENTS OR FAILURES	None.	
MAINTENANCE: RECORDS MANUAL	No records or manual are available.	
OPERATION: RECORDS MANUAL	No records or manual are available.	
OPERATIONAL PROCEDURES	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.	
MISCELLANEOUS		

GAI CONSULTANTS, INC.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00407
PENNDER ID # 52-65

SIZE OF DRAINAGE AREA: 1.87 square miles.
ELEVATION TOP NORMAL POOL: 1095.0 STORAGE CAPACITY: 166 acre-feet.
ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -
ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -
ELEVATION TOP DAM: 1096.3 STORAGE CAPACITY: 276 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 1095.0
TYPE: Uncontrolled, concrete, overflow weir structure.
CREST LENGTH: 44.6 feet.
CHANNEL LENGTH: N/A.
SPILLOVER LOCATION: Near center of embankment.
NUMBER AND TYPE OF GATES: N/A.

OUTLET WORKS

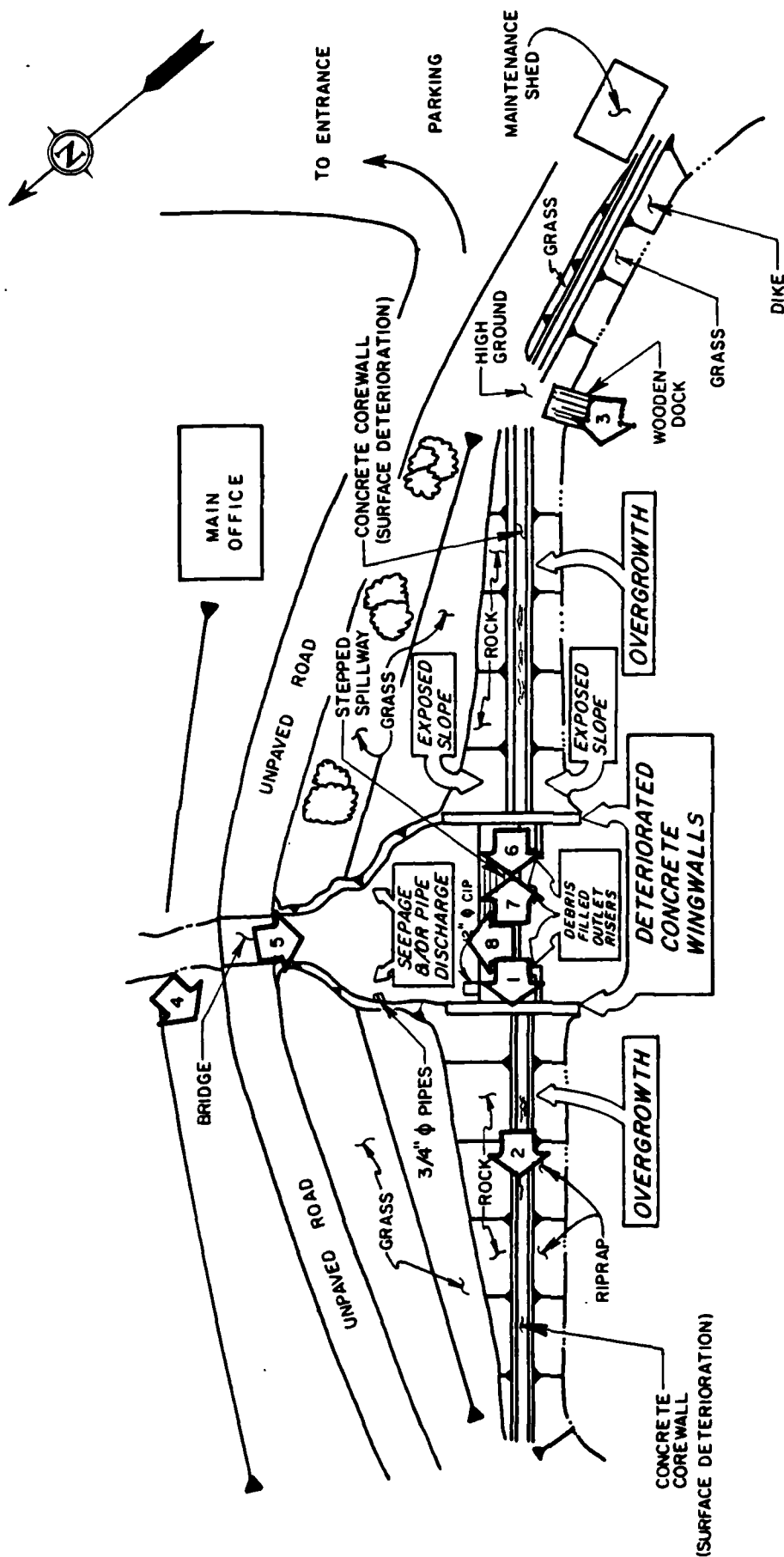
TYPE: Two 12-inch diameter cast iron pipes.
LOCATION: Adjacent right and left wingwalls on upstream side of spillway.
ENTRANCE INVERTS: 1087.0 (design).
EXIT INVERTS: 1087.0 (design); 1087.1 (field).
EMERGENCY DRAWDOWN FACILITIES: Two manually operated gate valves at inlets, presently inoperable.

HYDROMETEOROLOGICAL GAGES

TYPE: None.
LOCATION: N/A.
RECORDS: N/A.

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX C
PHOTOGRAPHS



WILD ACRES LAKE DAM
PHOTOGRAPH KEY MAP

PHOTOGRAPH 1 View of heavy vegetation along the embankment crest adjacent the left spillway wingwall.

PHOTOGRAPH 2 View of the embankment crest looking toward the left abutment from a point immediately left of the heavy concentration of vegetation viewed in Photograph 1.

PHOTOGRAPH 3 View of the upstream embankment face as seen from a small dock located at the knoll between the embankment and adjacent dike.

PHOTOGRAPH 4 View of the downstream embankment face and flat grassy area beyond the downstream toe to the left of the spillway.



2

4

1

3

PHOTOGRAPH 5 View, looking upstream, of the step-like downstream face of the spillway.

PHOTOGRAPH 6 View of the excessive deterioration evident in the left spillway wingwall.

PHOTOGRAPH 7 View of the embankment looking toward the right abutment and of the deteriorated right spillway wingwall.

PHOTOGRAPH 8 View of the channel immediately downstream of the spillway as seen from the embankment crest.



6



8



5



7

APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

- a. Development of an inflow hydrograph(s) to the reservoir.
- b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of occurrence the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

- a. Development of an inflow hydrograph(s) to the reservoir.
- b. Routing of the inflow hydrograph(s) through the reservoir.
- c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.
- d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevation(s) of failure hydrograph(s) for each location.

HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE

NAME OF DAM: WILD ACRES LAKE DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0 INCHES/24 HOURS (1)

STATION	1	2	3
STATION DESCRIPTION	NORTH LAKE DAM	SOUTH POND DAM	WILD ACRES LAKE DAM
DRAINAGE AREA (SQUARE MILES)	0.47	0.45	0.95
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	-	-	1.87
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	Zone 1	Zone 1	Zone 1
6 HOURS	111	111	111
12 HOURS	123	123	123
24 HOURS	133	133	133
48 HOURS	142	142	142
72 HOURS	-	-	-
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	1	1	1
C _p (3)	0.45	0.45	0.45
C _t (3)	1.23	1.23	1.23
L (MILES) (4)	1.5	1.1	-
L _{ca} (MILES) (4)	0.7	0.5	-
L' (MILES) (4)	-	-	0.7
t _p (MILES) (5)	1.25	1.03	0.99
SPILLWAY DATA			
CREST LENGTH (FEET)	25	10	44.6
FREEBOARD (FEET)	2.0	2.7	1.3

- (1) HYDROMETEOROLOGICAL REPORT 33, U.S. ARMY CORPS OF ENGINEERS, 1956.
- (2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).
- (3) SNYDER COEFFICIENTS
- (4) L = LENGTH OF LONGEST WATERCOURSE FROM DAM TO BASIN DIVIDE
L_{ca} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO POINT OPPOSITE BASIN CENTROID.
L' = LENGTH OF LONGEST WATERCOURSE FROM RESERVOIR INLET TO DRAINAGE DIVIDE.
- (5) $t_p = C_t (L \cdot L_{ca})^{0.3}$ or $t_p = C_t (L')^{0.6}$

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
BY DJS DATE 12-16-80 PROJ. NO. 80-238-407
CHKD. BY JRL DATE 12-19-80 SHEET NO. 1 OF 16



DAM STATISTICS

HEIGHT OF DAM = 9 FT (FIELD MEASURED: TOP OF DAM TO
OUTLET INVERT; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT
CALCULATION SHEETS REFERS TO THE FIELD MEASURED LOW AREA IN
THE EMBANKMENT CREST.)

NORMAL POOL STORAGE CAPACITY = 54×10^6 GALLONS
= 166 AC-FT (SEE NOTE 1)

MAXIMUM POOL STORAGE CAPACITY = 276 AC-FT (HEC-1)
(@ TOP OF DAM)

DRAINAGE AREA:

NORTH LAKE SUB-BASIN: 0.47 SQ. MI.

SOUTH AND SUB-BASIN: 0.45 SQ. MI.

LOCAL SUB-BASIN: 0.95 SQ. MI.

TOTAL: 1.87 SQ. MI.

(PLANIMETERED IN USGS 7.5' TOPS
QUAD - LAKE MARQUETTE, PA)

ELEVATIONS:

TOP OF DAM (DESIGN)	=	1096.5	(FIG. 2)
TOP OF DAM (FIELD)	=	1096.3	
NORMAL POOL	=	1095.0	(SEE NOTE 2)
SPILLWAY CREST	=	1095.0	
UPSTREAM INLET INVERT (DESIGN)	=	1087.0	(FIG. 2)
DOWNSTREAM OUTLET INVERT (DESIGN)	=	1087.0	(FIG. 2)
DOWNSTREAM OUTLET INVERT (FIELD)	=	1087.1	
STREAMBED @ DAM CENTERLINE	=	NOT KNOWN	

NOTE 1: OBTAINED FROM "REPORT UPON THE APPLICATION OF AUGUST KIEL,"
FOR THE CONSTRUCTION OF A DAM ACROSS A TRIBUTARY OF DECKERS CREEK,
IN DELAWARE TOWNSHIP, PINE COUNTY, PA; OCTOBER, 1927; FOUND IN
PENNSYLVANIA FILES.

SUBJECT

DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY

DJS

DATE

12-16-80

PROJ. NO.

80-238-407

CHKD. BY

JRL

DATE

12/19/80

SHEET NO.

2

OF

16



Engineers • Geologists • Planners
Environmental Specialists

NOTE 2: NORMAL POOL ELEVATION IS ESTIMATED TO BE APPROXIMATELY AT ELEVATION 1095.0, FROM USGS TOPO QUAD, LAKE MASKEGUSZA, PA. THE ELEVATIONS USED IN THIS ANALYSIS ARE CONSIDERED ESTIMATES, AND ARE NOT NECESSARILY ACCURATE.

DAM CLASSIFICATION

DAM SIZE: SMALL

(REF 1, TABLE 1)

HAZARD CLASSIFICATION: HIGH

(FIELD OBSERVATION)

REQUIRED SDF: 1/2 PMF TO PMF

(REF 1, TABLE 3)

HYDROGRAPH PARAMETERS

LENGTH OF LONGEST WATERCOURSE FROM RESERVOIR

INLET TO BASIN DIVIDE:

 $L' = 0.7$ MILES

(USGS TOPO QUAD - LAKE MASKEGUSZA, PA)

$$C_p = 0.45$$

$$C_e = 1.23$$

(SUPPLIED BY C.O.E., ZONE 1, DELAWARE
RIVER BASIN)

SNYDER'S STANDARD LAG:

$$t_p = C_e (L')^{0.6}$$

$$t_p = (1.23)(0.7)^{0.6}$$

$$t_p = 0.99 \text{ HOURS}$$

(SEE NOTE 3)

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY RJS DATE 12-16-80 PROJ. NO. 80-238-407
 CHKD. BY JRL DATE 12/19/80 SHEET NO. 3 OF 16



NOTE 3: SINCE L_{ca} , THE LENGTH OF THE LONGEST WATERCOURSE FROM THE DAM TO A POINT OPPOSITE THE DAM CENTROID, IS LESS THAN THE LENGTH OF THE RESERVOIR, THE SNYDER STANDARD L₂₆ IS ESTIMATED AS $T_p = C_t (L')^{0.6}$ HOURS (AS PER C.O.E., BALTIMORE DISTRICT). HYDROGRAPH VARIABLES USED HERE ARE DEFINED IN REF. 2, IN SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH."

RESERVOIR CAPACITY

RESERVOIR SURFACE AREAS:

SURFACE AREA (S.A.) @ NORMAL POOL (EL. 1095.0) = 82 ACRES

S.A. @ EL. 1100.0 = 96 ACRES

S.A. @ EL. 1120.0 = 135 ACRES

(USGS TOPO - LAKE MASHKEDZHA, PA)

S.A. @ TOP OF DAM (EL. 1096.3) = 85.6 ACRES

(BY LINEAR INTERPOLATION)

"ZERO-STORAGE ELEVATION"

BY USE OF THE CONIC METHOD,
 VOLUME @ NORMAL POOL = $\frac{1}{3} HA$,

WHERE H = MAXIMUM DEPTH OF RESERVOIR, IN FT,
 A = SURFACE AREA @ NORMAL POOL = 82 ACRES

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
BY ZJS DATE 12-16-80 PROJ. NO. 80-238-407
CHKD. BY JRL DATE 12/19/80 SHEET NO. 4 OF 16



$$Vol = \frac{1}{3} HA$$

$$106 \text{ AC-FT} = \frac{1}{3} H (80)$$

$$H = \frac{3(106)}{80} = \underline{6.1 \text{ FT}}$$

\therefore ZERO-STORAGE ASSUMED AT $1095.0 - 6.1 = \underline{1088.9}$

NOTE: ALTHOUGH THE MINIMUM RESERVOIR ELEVATION ACTUALLY OCCURS NEAR ELEVATION 1087.0, THE VALUE GIVEN ABOVE MUST BE USED IN THE HEC-1 INPUT IN ORDER TO MAINTAIN A STORAGE OF 106 AC-FT AT NORMAL POOL.

ELEVATION-STORAGE RELATIONSHIP:

AN ELEVATION-STORAGE RELATIONSHIP IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BY USE OF THE CONIC METHOD, BASED ON THE ELEVATION-SURFACE AREA DATA GIVEN ABOVE. (SEE SUMMARY INPUT/OUTPUT SHEETS.)

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
BY ZJS DATE 12-16-80 PROJ. NO. 80-238-407
CHKD. BY JRL DATE 12/19/80 SHEET NO. 5 OF 16



PMP CALCULATIONS

- APPROXIMATE RAINFALL INDEX = 22.0 INCHES
(CORRESPONDING TO A DURATION OF 24 HOURS AND A
DRAINAGE AREA OF 200 SQUARE MILES)

(REF 3, FIG. 1)

- DEPTH-AREA-DURATION ZONE 1

(REF 3, FIG. 1)

- ASSUME DATA CORRESPONDING TO A 10-SQUARE MILE AREA MAY
BE APPLIED TO THIS 0.95 SQUARE MILE BASIN:

<u>DURATION (HRS)</u>	<u>PERCENT OF INDEX RAINFALL</u>
6	111
12	123
24	133
48	142

(REF 3, FIG. 3)

HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AND FOR THE
LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN)
FOR A DRAINAGE AREA OF 0.95 SQUARE MILES IS 0.80.

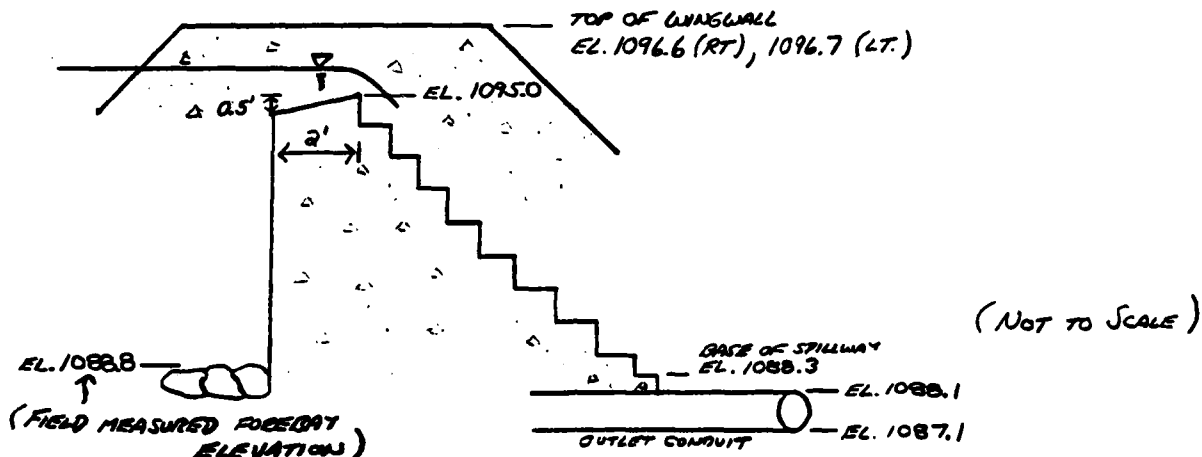
(REF 4, p. 48)

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY ATS DATE 12-16-80 PROJ. NO. 80-238-407
 CHKD. BY JRL DATE 12/19/80 SHEET NO. 6 OF 16

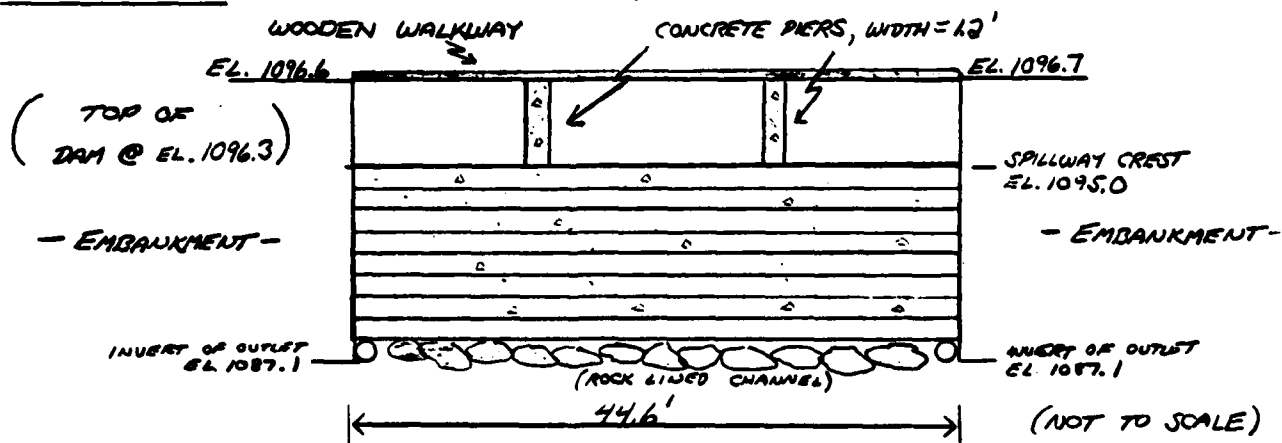


SPILLWAY CAPACITY

PROFILE:



CROSS-SECTION: (LOOKING UASTREAM)



(SKETCHES BASED ON FIELD MEASUREMENTS AND OBSERVATIONS AND DESIGN DRAWINGS.)

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY RTS DATE 12-17-80 PROJ. NO. 80-238-407

CHKD. BY JRL DATE 12/19/80 SHEET NO. 7 OF 16



THE SPILLWAY CONSISTS OF AN INCLINED-CRESTED WEIR, WITH A VERTICAL UPSTREAM FACE AND STEP-LIKE DOWNSTREAM FACE, AS SHOWN ON SHEET 6. DISCHARGE OVER THE WEIR CAN BE ESTIMATED BY THE EQUATION

$$Q = CLH^{3/2} \quad (\text{REF 5, p. 5-23})$$

WHERE Q = DISCHARGE, IN CFS,
 C = DISCHARGE COEFFICIENT,
 L = LENGTH OF WEIR CREST, IN FT.,
 H = HEAD, IN FT.

THE COEFFICIENT OF DISCHARGE IS ASSUMED TO BE ON THE ORDER OF 3.4, FROM REF. 5, p. 5-44. THE EFFECTIVE WEIR LENGTH = TOTAL WEIR LENGTH - WIDTH OF PIERS
 $= 44.6 - 2(12) = \underline{42.2 \text{ FT.}}$

IT IS ASSUMED THAT THERE ARE NO APPROACH LOSSES OR TAILWATER EFFECTS ACTING ON THE WEIR.

SPILLWAY RATING CURVE:

THE SPILLWAY RATING CURVE IS COMPUTED INTERNALLY IN THE HEC-1 COMPUTER PROGRAM, BY USE OF THE ABOVE EQUATION, AND WITH THE DATA GIVEN ABOVE.

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY RTS DATE 12-17-80 PROJ. NO. 80-238-407
 CHKD. BY JRL DATE 12/19/80 SHEET NO. 8 OF 16



EMBANKMENT RATING CURVE

DISCHARGE OVER THE EMBANKMENT WILL BE COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, WITH THE ASSUMPTION THAT CRITICAL DEPTH OCCURS ON THE CREST, AND WITH THE CREST PROFILE REPRESENTED BY A SERIES OF TRAPEZOIDS. (SEE SUMMARY INPUT/OUTPUT SHEETS FOR RATING TABLE.)

INPUT INFORMATION:

RESERVOIR ELEVATION (FT)	DEPTH ABOVE LOW TOP OF DAM (FT)	LENGTH OF CREST INUNDRATED (FT)
1096.3	—	0
1096.5	0.2	50
1096.6	0.3	65
1096.8	0.5	275
1096.9	0.6	335
1097.0	0.7	420
1097.2	0.9	495
1098.0	1.7	510
1099.0	2.7	535
1100.0	3.7	560

(BASED ON FIELD SURVEY AND USGS TOPO QMD,
LAKE MASKEGONNA, PA.)

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
BY JTS DATE 12-18-80 PROJ. NO. 80-238-407
CHKD. BY JRL DATE 12/19/80 SHEET NO. 9 OF 16



UPSTREAM DAMS:

NORTH LAKE DAM:

THE FOLLOWING DATA WAS OBTAINED FROM THE NATIONAL DAM INSPECTION PROGRAM - PHASE I INSPECTION REPORT FOR NORTH LAKE DAM, PENNSYLVANIA ID. No. 52-180, PREPARED BY GAI CONSULTANTS, INC.; JANUARY, 1981.

DRAINAGE AREA = 0.47 SQ MI.

PMP DATA : SEE SHEET 5.

SNYDER UNIT HYDROGRAPH DATA :

$$t_p = 1.25 \text{ HOURS}$$

$$C_p = 0.45$$

NORMAL POOL ELEVATION = 1225.0

LOW TOP OF DAM ELEVATION = 1227.0

RESERVOIR SURFACE AREA VS. ELEVATION DATA :

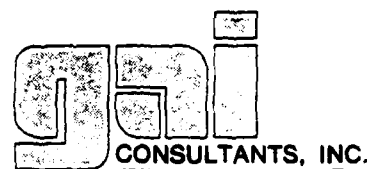
ELEVATION (FT)	SURFACE AREA (ACRES)
1209.0	0.0
1225.0	15.0
1227.0	16.9
1240.0	29.0

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY DJS DATE 12-19-80 PROJ. NO. 80-238-407

CHKD. BY JRL DATE 12/19/80 SHEET NO. 10 OF 16



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NORTH LAKE DAM:

FACILITY RATING TABLE:

<u>ELEVATION</u> <u>(FT)</u>	<u>OUTFLOW</u> <u>(CFS)</u>	<u>ELEVATION</u> <u>(FT)</u>	<u>OUTFLOW</u> <u>(CFS)</u>
1225.0	0	1228.3	700
1225.5	40	1228.5	800
1226.0	90	1228.7	880
1226.5	150	1229.0	1210
1227.0	240	1229.3	1720
1227.2	280	1229.5	2120
1227.9	520		

SOUTH POND DAM:

THE FOLLOWING DATA WAS OBTAINED FROM THE NATIONAL
DAM INSPECTION PROGRAM - PHASE I INSPECTION REPORT
FOR SOUTH POND DAM, PENNEDER I.D. No. 52-181, PREPARED BY
GAI CONSULTANTS, INC.; JANUARY, 1981.

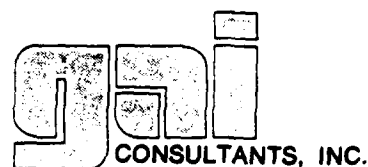
DRAINAGE AREA = 0.45 SQ. MI.

PMP DATA : SEE SHEET 5.

SNYDER UNIT HYDROGRAPH DATA:

$E_p = 1.03$ HOURS

$C_p = 0.45$

SUBJECT DAM SAFETY INSPECTIONWILD ACRES LAKE DAMBY DJS DATE 12-18-80 PROJ. NO. 80-238-407CHKD. BY JRL DATE 12-19-80 SHEET NO. 11 OF 16Engineers • Geologists • Planners
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NORMAL POOL ELEVATION = 1142.0

LOW TOP OF DAM ELEVATION = 1144.7

RESERVOIR SURFACE AREA VS. ELEVATION DATA:

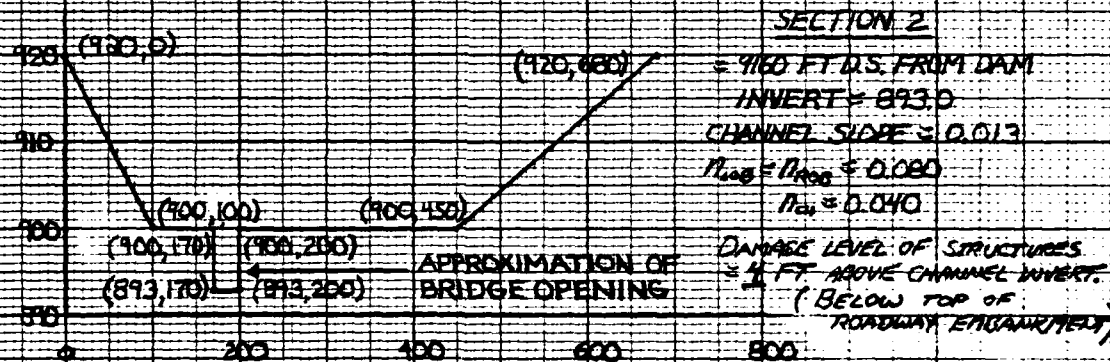
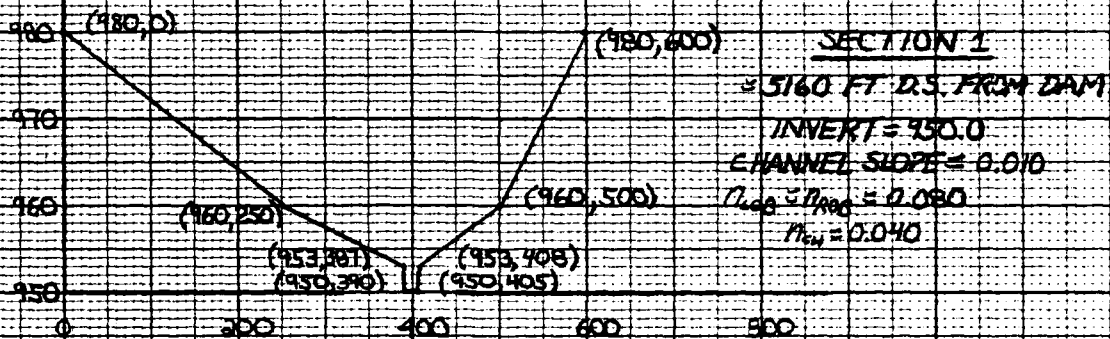
<u>ELEVATION</u> <u>(FT)</u>	<u>SURFACE AREA</u> <u>(ACRES)</u>
1132.0	0.0
1140.0	3.5
1142.0	6.0
1144.7	9.0
1160.0	26.0

FACILITY RATING TABLE:

<u>ELEVATION</u> <u>(FT)</u>	<u>OUTFLOW</u> <u>(CFS)</u>	<u>ELEVATION</u> <u>(FT)</u>	<u>OUTFLOW</u> <u>(CFS)</u>
1142.0	0	1145.0	280
1142.5	10	1145.3	340
1143.0	40	1145.5	420
1143.5	80	1145.8	620
1144.0	120	1146.0	750
1144.5	190	1146.5	1370
1144.7	220	1147.0	2190
		1148.0	4170

SUBJECT WILD ACRES LAKE DAM
 BY JTS DATE 12-27-80 SHEET NO. 12 OF 16
 CHKD. BY JAL DATE 1-2-81 PROJECT NO. 50-238-407

DOWNSTREAM ROUTING SECTIONS



(NOTE: SECTIONS BASED ON FIELD SURVEY AND OBSERVATIONS
 AND USGS TOPO QUAD - LAKE MASKENOZHA, PA. ELEVATIONS
 ARE CONSIDERED ESTIMATES AND ARE NOT NECESSARILY
 ACCURATE.)

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

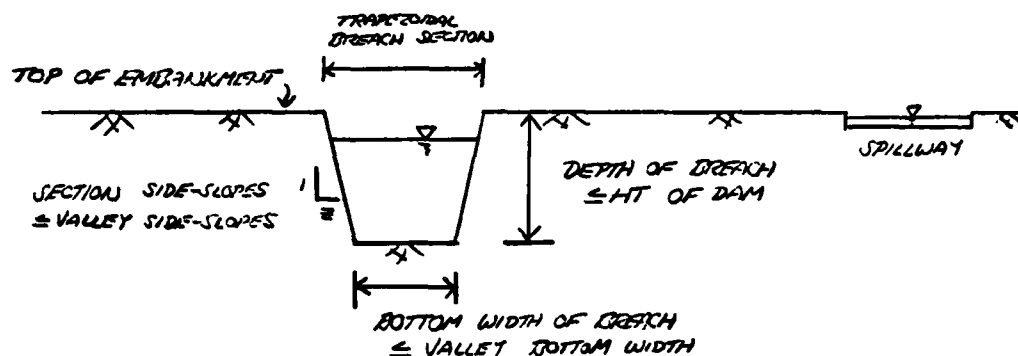
BY DJS DATE 12-27-80 PROJ. NO. 80-238-407

CHKD. BY JRL DATE 1-2-81 SHEET NO. 13 OF 16



BREACH ASSUMPTIONS

TYPICAL BREACH SECTION:



HEC-1 DAM BREACHING ANALYSIS INPUT:

WILD ACRES LAKE DAM

SOUTH POND DAM

PLAN	BREACH BOTTOM WIDTH (FT)	BREACH DEPTH (FT)	SECTION SIDE-SLOPES	BREACH TIME (HRS)	BREACH BOTTOM WIDTH (FT)	BREACH DEPTH (FT)	SECTION SIDE-SLOPES	BREACH TIME (HRS)
① MIN. BREACH SECTION, MIN. FAIL TIME	10	7.4	14:14	0.5	10	12.7	14:14	0.5
② MAX. BREACH SECTION, MIN. FAIL TIME	150	7.4	12:1	0.5	150	12.7	4:1	0.5
③ MIN. BREACH SECTION, MAX. FAIL TIME	10	7.4	1:1	3.0	10	12.7	1:1	3.0
④ MAX. BREACH SECTION MAX. FAIL TIME	150	7.4	12:1	3.0	150	12.7	4:1	3.0
⑤ AVERAGE POSSIBLE CONDITIONS	30	7.4	2:1	1.0	40	12.7	1:1	1.0

(ASSUME BREACHING OF AN EARTH DAM BEGINS WHEN RESERVOIR LEVEL REACHES LOW TOP OF DAM ELEVATION.)

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY DJS DATE 12-23-80 PROJ. NO. 80-238-407

CHKD. BY JRL DATE 1-2-81 SHEET NO. 14 OF 16



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THE BREACH ASSUMPTIONS LISTED ON SHEET 13 ARE BASED ON THE SUGGESTED RANGES PROVIDED BY THE C.O.E. (BALTIMORE DISTRICT), AND ON THE PHYSICAL CONSTRAINTS OF THE DAM AND SURROUNDING TERRAIN:

WILD ACRES LAKE DAM:

- DEPTH OF BREACH OPENING \approx 7.4 FT (LOW TOP OF DAM TO MINIMUM RESERVOIR ELEVATION)
- LENGTH OF BREACHABLE EMBANKMENT \approx 380 FT (FIELD MEASURED)
- VALLEY BOTTOM WIDTH \approx 150 FT (FIELD ESTIMATE)
- VALLEY SIDE-SLOPES ADJACENT TO DAM:

LEFT-SIDE: 15H:1V

RIGHT-SIDE: 10:1

(USGS TOPO QUAD -
LAKE MASKEGOSH, PA)

SOUTH POND DAM:

- DEPTH OF BREACH OPENING \approx 12.7 FT (LOW TOP OF DAM TO MINIMUM RESERVOIR ELEVATION)
- LENGTH OF BREACHABLE EMBANKMENT \approx 250 FT (FIELD MEASURED)
- VALLEY BOTTOM WIDTH \approx 150 FT (FIELD ESTIMATE)
- VALLEY SIDE-SLOPES ADJACENT TO DAM:

LEFT SIDE: 10:1

RIGHT SIDE: 10:1

(USGS TOPO QUAD -
LAKE MASKEGOSH, PA)

HEC-1 DAM BREACHING ANALYSIS OUTPUT

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY DJS DATE 12-30-80 PROJ. NO. 80-238-407
 CHKD. BY WJV DATE 1-3-81 SHEET NO. 15 OF 16



RESERVOIR DATA: UNDER 0.25 PMF BASE FLOW CONDITIONS:

DAM	PLAN	VARIABLE BREACH		ACTUAL MAX FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK (HRS)	INTERPOLATED OR HEC-1 ROUTED MAX. FLOW DURING FAIL TIME (CFS)	CORRESPONDING TIME OF PEAK (HRS)	ACTUAL PEAK FLOW THROUGH DAM (CFS)	CORRESPONDING TIME OF PEAK (HRS)	TIME OF INITIAL BREACH (HRS)
		SOUTH POND (FT)	WILD ACRES LAKE (FT)							
South Pond Dam	①	10	-	1610	41.17	1610	41.17	1610	41.17	40.67
	③	156	-	2212	40.87	2152	40.83	2212	40.87	40.67
	③	10	-	491	42.56	488	42.56	491	42.56	40.67
	④	150	-	656	41.17	656	41.17	656	41.17	40.67
	⑤	40	-	1146	41.23	1122	41.17	1146	41.23	40.67
Wild Acres Lake Dam	①	10	10	1326	40.67	1326	40.67	1512	41.33	40.17
	②	150	150	9080	40.67	9080	40.67	9080	40.67	40.17
	③	10	10	1495	43.17	1495	43.17	1495	43.17	40.17
	④	150	150	3356	42.17	3356	42.17	3356	42.17	40.17
	⑤	40	30	2874	41.17	2874	41.17	2874	41.17	40.17

NOTE: THE 0.25 PMF NON-BREACH PEAK OUTFLOW = 280 CFS FOR SOUTH POND DAM.
 THE 0.25 PMF NON-BREACH PEAK OUTFLOW = 960 CFS FOR WILD ACRES LAKE DAM.

SUBJECT DAM SAFETY INSPECTIONWILD ACRES LAKE DAMBY JJS DATE 12-30-80 PROJ. NO. 80-238-407CHKD. BY WJV DATE 1-3-81 SHEET NO. 16 OF 16Engineers • Geologists • Planners
Environmental SpecialistsDOWNSTREAM ROUTING DATA: (UNDER 0.25PMIF BASE FLOW CONDITIONS)OUTPUT @ SECTION 2; 9160 FT D.S. FROM WILD ACRES LAKE DAM:

PLAN	PEAK FLOW (CFS)	CORRESPONDING WATER SURFACE ELEVATION (FT)	WATER SURFACE* ELEVATION W/O BREACH (FT)	ELEVATION DIFFERENCE (FT)
①	1452	897.8	896.6	+ 1.2
②	5553	901.8	896.6	+ 5.2
③	1463	897.8	896.6	+ 1.2
④	3203	900.5	896.6	+ 3.9
⑤	2548	900.0	896.6	+ 3.4

* FROM SUMMARY INPUT/OUTPUT SHEETS, SHEET S.NOTE: DAMAGE LEVEL OF STRUCTURES AT SECTION 2 (CAMP
LOG-N-TWIG) = 897-900 FT - SEE SHEET 12.

SUBJECT

DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY WJV

DATE 12-30-80

PROJ. NO. 90-239-407

CHKD. BY DJS

DATE 1-2-81

SHEET NO. A OF S

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SUMMARY INPUT/OUTPUT SHEETS

OVERTOPPING ANALYSIS

DAM SAFETY INSPECTION
WILD ACRES LAKE DAM *** (OVERTOP ANALYSIS) *** (U.S. DAMS INCLUDED)
10-MINUTE TIME STEP AND 48-HOUR STORM QUANTUM

JOB SPECIFICATION									
MD	MNR	MNIN	IDAY	IHR	IMIN	METMC	IPLT	IPRT	INSTAN
288	0	10	0	0	0	0	0	0	0
	JUPER	MWT	LRUPT	TRACE					
	5	0	0	0					

MULTI-PLAN ANALYSES TO BE PERFORMED

NPLAN= 1 NRTIO= 4 LRTIO= 1

NRTIO= .10 .20 .50 1.00

SUR-AREA KUNUFF COMPUTATION

SOUTH POND DAM - RESERVOIR INFLOW

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRRT	INAME	ISTAGE	IAITU
SPD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INTOG	IUNG	IAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	INCAL
1	1	.45	0.00	1.87	0.00	0.000	0	1	0

PRECIP DATA

SPEE	PMS	R6	R12	R24	K48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .600

LOSS DATA

LNOUT	SINKR	DLTR	RTIOL	ENAIN	STKRS	RTIOL	STRTL	CMSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

INITIAL AND CONSTANT
AS PER COE

UNIT HYDROGRAPH DATA

TP= 1.03 CP= .45 NTA= 0

BASE FLOW PARAMETERS

AS PER COE

APPROXIMATE CLANK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.70 AND N= 9.68 INTERVALS

UNIT HYDROGRAPH 55 END-OF-PERIOD UNDERTAKES, IAG= 1.04 HOURS, CP= .45 VOLE= 1.00									
I.	26.	53.	82.	108.	124.	128.	119.	107.	97.
77.	79.	71.	64.	58.	57.	47.	42.	38.	34.
31.	24.	25.	23.	21.	19.	17.	15.	14.	12.
11.	10.	9.	7.	7.	6.	5.	5.	4.	4.
4.	4.	3.	3.	3.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

END-OF-PERIOD FLOW
MU.DA MU.MM PERIOD NAIN EXCS LOSS CUMP U MU.DA HR.MM PERIOD NAIN EXCS LOSS CUMP O

SUM 24.99 22.60 2.39 J8601.
(635.1(574.1(61.1(1093.06)

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-30-90 PROJ. NO. 80-239-407
 CHKD. BY RTS DATE 1-2-81 SHEET NO. B OF S



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O.10 PMF		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
		179.	80.	26.	13.	3856.
O.50 PMF		CFS	2.	1.	0.	109.
		CMH	1.65	2.18	2.21	2.21
PMF		INCHES	41.95	55.25	56.25	66.25
		MM	40.	52.	53.	53.
		AC-FT	49.	64.	66.	66.
		THOUS CU YD				
		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
		645.	399.	132.	67.	19282.
		CMH	11.	4.	2.	546.
		INCHES	8.26	10.88	11.07	11.07
		MM	209.76	276.25	281.24	281.24
		AC-FT	188.	261.	266.	266.
		THOUS CU YD	244.	322.	328.	328.
		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
		1289.	799.	263.	134.	38565.
		CMH	21.	7.	4.	1092.
		INCHES	16.52	21.75	22.14	22.14
		MM	419.53	552.50	562.47	562.47
		AC-FT	396.	522.	531.	531.
		THOUS CU YD	489.	644.	655.	655.

SOUTH POND DAM
 RESERVOIR
 INFLOW
 HYDROGRAPH

HYDROGRAPH ROUTING

ROUTE THROUGH SOUTH POND

ISTAO	ICOMP	IECOM	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SPD	1		0	0	0	1	0	0
ROUTING DATA								
OLOSS	CLOSS	AVG	INES	ISAME	IUPT	IPMP	LSTR	
0.0	0.000	0.00	1	1	0	0	0	
NSTPS NSTDL LAG ANSKK K TSK STORA ISPRAT								
	1	0	0	0.000	0.000	0.000	-1142.	-1
STAGE	1142.50	1143.00	1143.50	1144.00	1144.50	1144.70	1145.00	1145.30
	1145.80	1146.50	1147.00	1148.00				
FLOW	0.00	40.00	80.00	120.00	190.00	220.00	280.00	340.00
	620.00	1370.00	2190.00	4170.00				
SURFACE AREA= 0. 4. 6. 9. 26.								
CAPACITY= 0. 9. 19. 39. 295.								
ELEVATIONS=	1132.	1140.	1142.	1145.	1160.			

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY WJV DATE 12-30-80 PROJ. NO. 80-239-407

CHKD. BY DJS DATE 1-2-81 SHEET NO. C OF S



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0.10 PMF

0.50 PMF

PMF

PEAK OUTFLOW IS 102. AT TIME 41.83 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
102.	75.	25.	13.	3604.
3.	2.	1.	0.	102.
	1.55	2.04	2.07	2.07
	39.35	51.81	52.56	52.56
	37.	49.	50.	50.
	46.	60.	61.	61.

PEAK OUTFLOW IS 629. AT TIME 40.83 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
629.	391.	128.	65.	18731.
18.	11.	4.	2.	530.
	8.09	10.61	10.76	10.76
	205.37	269.46	273.20	273.20
	194.	254.	258.	258.
	239.	314.	318.	318.

PEAK OUTFLOW IS 1275. AT TIME 40.83 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
1275.	794.	258.	131.	37233.
36.	22.	1.	4.	1068.
	16.41	21.36	21.67	21.67
	416.81	542.50	550.34	550.34
	394.	512.	520.	520.
	486.	632.	641.	641.

SUB-AREA RUNOFF COMPUTATION

NORTH LAKE DAM - RESERVOIR INFLOW

ISTAO	ICOMP	ICON	ITAPE	JPLT	JPRY	INAME	ISTAGE	IAUTO
0	0	0	0	0	0	1	0	0

INTDC	INTG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISUM	ISAME	LOCAL
1	1	.47	0.00	1.87	0.00	0.000	0	1	0

PRECIP DATA			
SPEE	PMS	R6	R72
0.00	22.00	111.00	133.00
			142.00

THSPC COMPUTED AT THE PROGRAM IS .000

LOSS DATA			
LRUPT	STRAR	RTIOL	RTIOL
0	0.00	1.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.25 CP= .45 NIA= 0

NECESSARY DATA
STKTO= -1.50 ORCSN= -.05 NTION= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNIDFA CP AND TP ARE TC= 7.92 AND R=11.95 INTERVALS

SOUTH POND DAM

RESERVOIR

OUTFLOW

HYDROGRAPH



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UNIT HYDROGRAPH 68										END-OF-PERIOD ORIGINATES, LAGs		1.25 HOURS, CFS		.45 VOLUME 1.00	
NO. OF	HR. MM	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLUM		HR. MM	PERIOD	RAIN	EXCS	LOSS	CUMP O		
						CUMP O	MI. DA								
5.			17.	35.	57.	76.	95.			107.	110.		97.		
9.			82.	76.	64.	64.	54.			50.	46.		46.		
39.			33.	30.	28.	25.	23.			22.	20.		18.		
17.			15.	14.	13.	12.	11.			10.	9.		9.		
7.			7.	6.	5.	5.	4.			4.	3.		3.		
3.			3.	3.	2.	2.	2.			2.	2.		1.		
1.			1.	1.	1.	1.	1.			1.					

0

NO. OF

HR. MM

PERIOD

RAIN

EXCS

LOSS

END-OF-PERIOD FLUM

CUMP O

MI. DA

HR. MM

PERIOD

RAIN

EXCS

LOSS

CUMP O

(635.1)

(574.)

(61.)

(1127.44)

19615.

SUM

24.49

22.60

2.39

19615.

0.10 PMF

0.50 PMF

PMF

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
121.	80.	27.	14.	397.
3.	2.	1.	0.	11.
	1.58	2.19	2.19	2.19
	40.23	54.55	55.53	55.53
	40.	54.	55.	55.
	49.	66.	68.	68.
PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
601.	400.	136.	69.	1506.1.
17.	11.	4.	2.	56.3.
	1.92	10.74	10.93	10.93
	201.16	272.77	277.66	277.66
	198.	269.	274.	274.
	245.	332.	338.	338.
PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
1207.	800.	271.	138.	39767.
34.	23.	6.	4.	1126.
	15.84	21.48	21.66	21.86
	402.32	545.54	555.32	555.32
	397.	539.	548.	548.
	489.	664.	676.	676.

HYDROGRAPH ROUTING

[illegible]

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-30-80 PROJ. NO. 80-238-407
 CHKD. BY 205 DATE 1-2-81 SHEET NO. 11 OF 5



SURFACE AREA=	0.	15.	17.	29.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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NORTH POND DAM
 RESERVOIR
 OUTFLOW
 HYDROGRAPHS

***** SUB-AREA RUNOFF COMPUTATION *****

ISTAQ	ICUMP	IECON	ITAPE	JPLI	JPMI	INAME	ISTAGE	IAUTO
0	0	0	0	0	0	1	0	0
INTUG	INTUG	INTUG	INTUG	INTUG	INTUG	INTUG	INTUG	INTUG
1	1	1	1	1	1	1	1	1
0.95	0.00	1.07	0.00	0.000	0.000	0	1	0

HYDROGRAPH DATA

SUBJECT DAM SAFETY INSPECTIONWILD ACRES LAKE DAMBY WJV DATE 12-30-80 PROJ. NO. 90-239-407CHKD. BY DJS DATE 1-2-81 SHEET NO. F OF SEngineers • Geologists • Planners
Environmental SpecialistsPRECIP DATA
SPFE 0.00 22.00 111.00 123.00 133.00 142.00 0.00
M6 M12 M24 M48 M72 M96
TNSPC COMPUTED BY THE PROGRAM IS .800LOSS DATA
LNUPD 0 0.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
STKRN ULTRN RTIUL ERAIN STKRS RTIOK STKTL CMSTL ALSMX NTIMP
0 0.00 0.00 1.00 0.00 0.00 1.00 1.00 .05 0.00 0.00UNIT HYDROGRAPH DATA
TP= .99 CP= .45 NTA= 0APPROXIMATE CLARK COEFFICIENTS FROM GIVEN ENTRY CP AND TP ARE TC= 6.36 AND R= 9.32 INTERVALS
NECESSATION DATA
STKTR= -1.50 QKCSM= -.05 RIORS= 2.00
CP AND TP ARE TC= 6.36 AND R= 9.32 INTERVALSUNIT HYDROGRAPH 53 END-OF-PERIOD UNDIMATES, LAG= 1.00 HOURS, CP= .45 VOL= 1.00
16. 61. 124. 192. 248. 279. 252. 227. 204.
143. 164. 147. 132. 119. 107. 96. 77. 70.
62. 56. 50. 45. 41. 37. 33. 29. 26.
21. 19. 17. 15. 14. 12. 11. 10. 9.
7. 6. 5. 4. 4. 3. 3. 3.
2. 2.END-OF-PERIOD FLOW
MO.DA HR.MM PERIOD RAIN EXCS LOSS COMP O HR.MM PERIOD RAIN EXCS LOSS COMP O
SUM 24.99 22.60 2.39 81600.
(635.1(574.1(61.1(2310.65)

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
277.	170.	56.	28.	8154.
0.	5.	2.	1.	231.
	1.66	2.18	2.22	2.22
	42.23	55.34	56.34	56.34
	84.	110.	112.	112.
	104.	136.	139.	139.

0.10 PMF

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
1385.	649.	278.	142.	40772.
39.	24.	8.	4.	1155.
	8.31	10.89	11.09	11.09
	211.13	276.68	281.69	281.69
	421.	552.	562.	562.
	519.	680.	693.	693.

0.50 PMF

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
2769.	1698.	556.	283.	81545.
78.	48.	16.	8.	2309.
	16.62	21.79	22.18	22.18
	422.26	553.37	563.37	563.37
	842.	1103.	1123.	1123.
	1038.	1361.	1385.	1385.

PMF

WILD ACRES LAKE DAM
LOCAL RESERVOIR
INFLOW
HYDROGRAPHIC

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-30-80 PROJ. NO. 80-239-407
 CHKD. BY 255 DATE 1-2-81 SHEET NO. G OF S



0.10 PMF

0.50 PMF

PMF

COMBINE ROUTED HYDROGRAPHS FROM U.S. DAMS WITH P.A. LAKE INFLOW HYDROGRAPH
 COMBINE HYDROGRAPHS

ISTAO 1CUMP IECUM I7APE JPLT JPRY INAME ISTAGE IAUTO
 WAL 3 0 0 0 0 0 0 0

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 420. 304. 105. 53. 15367.
 CFS 12. 9. 3. 2. 435.
 INCHES 1.51 2.09 2.12 2.12
 MM 30.44 53.03 53.94 53.94
 AC-FT 151. 208. 212. 212.
 THOUS CU M 186. 257. 261. 261.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 2439. 1595. 534. 272. 78230.
 CFS 69. 45. 15. 8. 2215.
 INCHES 7.93 10.63 10.81 10.81
 MM 201.52 270.07 274.57 274.57
 AC-FT 791. 1060. 1078. 1078.
 THOUS CU M 976. 1307. 1329. 1329.

PEAK 6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME
 CFS 5085. 3246. 1075. 546. 167338.
 CFS 144. 30. 15. 15. 4455.
 INCHES 16.15 21.38 21.74 21.74
 MM 410.20 543.15 552.22 552.22
 AC-FT 1910. 2132. 2167. 2167.
 THOUS CU M 1986. 2629. 2673. 2673.

WILD ACRES LAKE DAM
 TOTAL RESERVOIR
 INFLOW HYDROGRAPHS

ROUTE TOTAL HYDROGRAPH THROUGH WILD ACRES LAKE
 HYDROGRAPH ROUTING

ISTAO 1CUMP IECUM I7APE JPLT JPRY INAME ISTAGE IAUTO
 WAL 1 0 0 0 0 0 0 0
 QLOSS CLOSS AVG ROUTING DATA LSTR
 0.0 0.000 0.00 1 1 0 0 0
 NSTPS NSTDL LAG ANSKK X TSK STORA ISPRAT
 1 0 0 0.000 0.000 0.000 -1095. 0

SURFACE AREA 0. 82. 86. 96. 135.
 CAPACITY 0. 167. 276. 611. 2910.
 FLOODVATIONS 1089. 1095. 1096. 1100. 1120.
 CREL SPWID CROM EXPH FLEVL COOL CAREA EXPL
 1095.0 47.2 3.4 1.5 0.0 0.0 0.0 0.0

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY WJV DATE 12-30-80 PROJ. NO. 90-238-407

CHKD. BY DJS DATE 1-2-81 SHEET NO. H OF S



CREST LENGTH 0. 50. 65. 275. 335. 420. 495. 510. 535. 560.
AT OR BELOW ELEVATION 1096.3 1096.5 1096.6 1096.8 1096.9 1097.0 1097.3 1098.0 1099.0 1100.0

DAM DATA
TOPEL CUOD LRPD DAMIED
1096.3 0.0 0.0 0.0

PEAK OUTFLOW IS 219. AT TIME 44.00 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
219.	194.	63.	32.	9143.
CFS				
6.	6.	2.	1.	253.
INCHES	.97	1.26	1.26	1.26
MM	24.55	31.49	32.09	32.09
AC-FT	96.	126.	126.	126.
THOUS CU M	119.	155.	155.	155.

0.10 PMF

PEAK OUTFLOW IS 2290. AT TIME 41.50 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
2290.	1521.	469.	236.	67893.
CFS				
65.	43.	13.	7.	1923.
INCHES	7.57	9.34	9.38	9.38
MM	192.15	237.28	238.29	238.29
AC-FT	754.	931.	935.	935.
THOUS CU M	930.	1149.	1154.	1154.

0.50 PMF

PEAK OUTFLOW IS 4879. AT TIME 41.17 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
4879.	3207.	1006.	506.	145647.
CFS				
130.	91.	28.	14.	4124.
INCHES	15.56	20.02	20.13	20.13
MM	405.27	508.49	511.19	511.19
AC-FT	1590.	1996.	2006.	2006.
THOUS CU M	1962.	2461.	2475.	2475.

PMF

HYDROGRAPH ROUTING

ROUTE FROM WAL DAM TO SECTION 11 5100 FT D.S. FROM DAM

ISTAU	ICUMP	ICUM	ITAPE	UPLT	JPNT	INAME	ISTAGE	IAUTO
"ALI	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

GLOSS	CLOSS	AVG	IAES	ISAKE	IOPT	IPAP	LSTA
0.0	0.000	0.00	1	1	0	0	0
MSIPS	MSFUL	LAG	APSKK	X	TSK	STURA	ISPNT
1	0	0	0.000	0.000	0.000	-1.	0

WILD ACRES LAKE DAM
TOTAL RESERVOIR
OUTFLOW
HYDROGRAPHS

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-30-80 PROJ. NO. 80-236-407
 CHKD. BY RJS DATE 1-2-81 SHEET NO. I OF S



MINIMAL DEPTH CHANNEL ROUTING

UN(1)	UN(2)	UN(3)	ELNVT	ELMAX	RLNTH	SEL
.0800	.0400	.0800	950.0	980.0	5160.	.01000

CROSS SECTION COORDINATES--STA.ELEV, STA.ELEV--ETC						
0.00	980.00	250.00	960.00	387.00	953.00	390.00
400.00	953.00	500.00	960.00	600.00	980.00	950.00

STORAGE	0.00	3.10	6.84	16.56	35.95	65.00	103.70	151.07	203.86
	324.95	393.24	466.70	545.33	629.13	718.09	812.23	911.53	1016.00

OUTFLOW	0.00	118.80	387.15	911.74	1862.21	3394.57	5641.06	8864.56	13002.73
	23874.49	30670.95	38420.67	47159.66	56924.33	67751.13	79676.44	92736.39	105966.86

STAGE	950.00	951.58	953.16	954.74	956.32	957.89	959.47	961.05	962.63
	965.79	967.37	968.95	970.53	972.11	973.68	975.26	976.84	978.42

FLOW	0.00	118.80	387.15	911.74	1862.21	3394.57	5641.06	8864.56	13002.73
	23874.49	30670.95	38420.67	47159.66	56924.33	67751.13	79676.44	92736.39	105966.86

HYDROGRAPH ROUTING

ROUTE FROM SECTION 1 TO SECTION 2; 9160 FT D.S. FROM DAM

ISTAO	ICOMP	IECUM	ITAPE	JPLT	JPRI	INAME	ISTAGE	IAUTO
102	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME			
OLUSS	CLOSS	AVG	IRCS
0.0	0.000	0.00	1

ROUTING DATA			
IPAP	IUPT	IPAP	ISTH
0	0	0	0

ROUTING DATA			
LAG	ANSKK	X	TSK
0	0.000	0.000	0.000

ROUTING DATA			
STORA	ISPHAT	ISPHAT	ISPHAT
-1.	0	0	0

MINIMAL DEPTH CHANNEL ROUTING

UN(1)	UN(2)	UN(3)	ELNVT	ELMAX	RLNTH	SEL
.0800	.0400	.0800	950.0	980.0	4000.	.01300

CROSS SECTION COORDINATES--STA.ELEV, STA.ELEV--ETC						
0.00	920.00	100.00	900.00	170.00	900.00	170.00
200.00	900.00	450.00	900.00	600.00	910.00	693.00

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-30-80 PROJ. NO. 80-238-407
 CHKD. BY RTS DATE 1-2-81 SHEET NO. J OF S



STORAGE	0.00	3.91	7.83	11.74	15.66	22.68	70.10	120.54	174.14
	290.41	353.14	418.93	487.77	559.68	634.65	712.67	793.76	877.90
INTAKE	0.00	215.46	647.22	1208.78	1861.96	2607.94	4905.94	8771.60	13942.71
	27886.26	36599.83	46464.29	57403.45	69666.51	83026.37	97578.55	113340.49	130331.01
STAGE	893.00	894.42	895.84	897.26	898.68	900.11	901.53	902.95	904.37
	907.21	908.63	910.05	911.47	912.89	914.32	915.74	917.16	918.58
FLOW	0.00	215.46	647.22	1208.78	1861.96	2607.94	4905.94	8771.60	13942.71
	27886.26	36599.83	46464.29	57403.45	69666.51	83026.37	97578.55	113340.49	130331.01

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1142.00	1142.00	1144.70
STORAGE	19.	19.	39.
OUTFLOW	0.	0.	220.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME UP FAILURE HOURS
.10	1143.77	0.00	31.	102.	0.00	41.83	0.00
.20	1144.70	0.00	39.	220.	0.00	41.50	0.00
.50	1145.81	1.11	49.	829.	5.17	40.83	0.00
1.00	1146.42	1.72	56.	1275.	7.83	40.83	0.00

SOUTH
POUND
DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1225.00	1225.00	1227.00
STORAGE	80.	80.	112.
OUTFLOW	0.	0.	240.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME UP FAILURE HOURS
.10	1225.98	0.00	95.	59.	0.00	42.67	0.00
.20	1226.72	0.00	107.	190.	0.00	42.33	0.00
.50	1227.96	.96	128.	545.	5.00	41.67	0.00
1.00	1228.97	1.97	147.	1177.	8.00	41.17	0.00

NORTH
POUND
DAM

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1095.00	1095.00	1096.30
STORAGE	167.	167.	276.
OUTFLOW	0.	0.	213.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME UP FAILURE HOURS
.10	1096.22	.02	278.	219.	1.67	44.00	0.00
.20	1097.06	.76	341.	687.	7.67	42.83	0.00
.50	1097.81	1.51	408.	2290.	9.67	41.50	0.00
1.00	1098.63	2.33	482.	4879.	11.50	41.17	0.00

WILD
ACRES
LAKE
DAM

SPILLWAY CAPACITY
AT LOW TOP OF DAM.

OVERTOPPING
OCCURS @
~ 0.10 PM F

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY WJV DATE 12-30-80 PROJ. NO. 80-238-407

CHKD. BY 205 DATE 1-2-81 SHEET NO. K OF S



Engineers • Geologists • Planners
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BREACHING ANALYSIS

DAM SAFETY INSPECTION
WILD ACRES LAKE DAM ** [BREACH ANALYSIS] ** (U.S. DAMS INCLUDED)
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION									
NO	MHR	MMIN	IDAY	IMIN	METNC	IPL1	IPRT	INSTAN	
200	0	10	0	0	0	0	0	0	0
			JUPER	NWT	LNAPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 6 NRTIME= 1 INTIME= 1

RTIME= .25

HYDROGRAPH ROUTING

ROUTE THROUGH SOUTH POND

DAM DATA
TUPEL CUUD EXPD DAMHID
1144.7 -0.0 0.0 0.

DAM BREACH DATA
UNWID Z ELBM TFALL WSEL FAILREL
10. 1.00 1132.00 .50 1142.00 1144.70

STATION SPD . PLAN 1, RATIO 1

BEGIN DAM FAILURE AT 40.67 HOURS
PEAK OUTFLOW IS 1610. AT TIME 41.17 HOURS

PLAN

①

SOUTH
POND
DAM

DAM BREACH DATA
BRWID Z ELBM TFALL WSEL FAILREL
150. 4.00 1132.00 .50 1142.00 1144.70

STATION SPD . PLAN 2, RATIO 1

BEGIN DAM FAILURE AT 40.67 HOURS
PEAK OUTFLOW IS 2212. AT TIME 40.87 HOURS

②

DAM BREACH DATA
BRWID Z ELBM TFALL WSEL FAILREL
10. 1.00 1132.00 3.00 1142.00 1144.70

STATION SPD . PLAN 3, RATIO 1

BEGIN DAM FAILURE AT 40.67 HOURS
PEAK OUTFLOW IS 491. AT TIME 42.56 HOURS

③

INPUT DATA IS
SAME AS FOR
OVERTOPPING ANALYSIS
WITH THE ADDITION
OF THE BREACH DATA
GIVEN HERE

PLAN

④

⑤

FOR
ALL
PLANS

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
BY WJV DATE 12-31-90 PROJ. NO. 90-238-407
CHKD. BY DJS DATE 1-2-91 SHEET NO. L OF 5



SOUTH
POJD
DAM

NORTH
POJD
DAM

WILD
ACRES -
LAKE -
LOCAL
INFLOW

WILD
ACRES -
LAKE -
TOTAL
INFLOW

DAM BREACH DATA
BREACH 2 ELUM TFAIL WSEL FAILED
150. 4.00 1132.00 3.00 1142.00 1144.70
STATION SPD . PLAN 4. RATIO 1

WILSON DAM FAILURE AT 40.67 HOURS

PEAK INFLOW IS 656. AT TIME 41.17 HOURS

DAM BREACH DATA
BREACH 2 ELUM TFAIL WSEL FAILED
40. 1.00 1132.00 1.00 1142.00 1144.70
STATION SPD . PLAN 5. RATIO 1

WILSON DAM FAILURE AT 40.67 HOURS

PEAK INFLOW IS 1146. AT TIME 41.23 HOURS

HYDROGRAPH ROUTING

ROUTE THROUGH NORTH LAKE

PEAK INFLOW IS 244. AT TIME 42.17 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	244.	103.	63.	32.	9201.
CMS	7.	5.	2.	1.	261.
INCHES	3.62	4.98	5.06	5.06	128.48
MM	92.05	126.38	128.48	127.	156.
AC-FT	97.	125.	131.	131.	156.
THOUS CU M	112.	154.	156.	156.	156.

SUR-AREA RUNOFF COMPUTATION

WILD ACRES LAKE DAM - RESERVOIR INFLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	692.	424.	139.	71.	20386.
CMS	20.	12.	4.	2.	577.
INCHES	4.16	5.45	5.54	5.54	140.84
MM	105.57	138.34	140.84	140.84	281.
AC-FT	210.	276.	281.	281.	346.
THOUS CU M	260.	340.	346.	346.	346.

COMBINE HYDROGRAPHS

COMBINE ROUTED HYDROGRAPHS FROM U.S. DAMS WITH W.A. LAKE INFLOW HYDROGRAPH

ISTAD	ICUMP	ISUM	ITAPE	IPPT	ITRAME	ISTAGE	IAUTD
WAL	3	0	0	0	0	1	0
PEAK	2443.	69.	244.	277.	141.	141.	40600.
CFS	692.	24.	24.	8.	4.	4.	1150.
CMS	20.	4.20	5.52	5.61	5.61	5.61	142.50
INCHES	106.62	140.25	142.50	142.50	142.50	142.50	559.
MM	418.	550.	559.	559.	559.	559.	690.
AC-FT	516.	679.	690.	690.	690.	690.	690.
THOUS CU M	516.	679.	690.	690.	690.	690.	690.

①

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-31-80 PROJ. NO. 80-239-407
 CHKD. BY 225 DATE 1-2-81 SHEET NO. M OF S



WILD
ACRES
LAKE
INFLOWS

WILD
ACRES
LAKE
DAM

PLAN

②	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
	3992.	238.	276.	190.	9977.
	65.	24.	8.	4.	1143.
	INCHES	4.17	5.49	5.58	5.58
	MM	105.86	139.46	141.72	141.72
③	AC-FT	415.	547.	556.	556.
	THOUS CU M	512.	675.	686.	686.
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
	1231.	843.	277.	141.	40563.
	35.	24.	8.	4.	1149.
④	INCHES	4.20	5.52	5.61	5.61
	MM	106.56	140.19	142.44	142.44
	AC-FT	418.	550.	559.	559.
	THOUS CU M	516.	679.	690.	690.
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
⑤	1488.	843.	277.	141.	40569.
	42.	24.	8.	4.	1149.
	INCHES	4.19	5.52	5.61	5.61
	MM	106.52	140.14	142.39	142.39
	AC-FT	418.	550.	559.	559.
①	THOUS CU M	516.	678.	689.	689.
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
	1954.	843.	277.	141.	40567.
	55.	24.	8.	4.	1149.
	INCHES	4.19	5.52	5.61	5.61
①	MM	106.52	140.13	142.38	142.38
	AC-FT	418.	550.	559.	559.
	THOUS CU M	516.	678.	689.	689.

HYDROGRAPH ROUTING
 MINUTE TOTAL HYDROGRAPH THROUGH WILD ACRES LAKE

TIME	DAM DATA			
	INFL	CUIN	EXP	DAMID
1096.3	0.0	0.0	0.0	0.
DAM BREACH DATA				
BRWD	2	ELON	TRAIL	WSEL
10.	1.00	1088.90	.50	1095.00
				1096.30
STATION WAL : PLAN 1, RATIO 1				

PEAK DAM FAILURE AT 40.17 HOURS
 PEAK OUTFLOW IS 1512. AT TIME 41.33 HOURS

SUBJECT

DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY

WJV

DATE

12-31-80

PROJ. NO.

80-239-407

CHKD. BY

DJS

DATE

1-2-81

SHEET NO.

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OF

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Engineers • Geologists • Planners
Environmental SpecialistsWILD
ACRES
LAKE
DAM

PLAN

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④

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DAM BREACH DATA
BRWD 2 ELBM TFAIL WSEL FAILED
150. 12.00 1088.90 .50 1095.00 1096.30
STATION WAL . PLAN 2, RATIO 1

BEGIN DAM FAILURE AT 40.17 HOURS
PEAK OUTFLOW IS 9080. AT TIME 40.67 HOURS

DAM BREACH DATA
BRWD 2 ELBM TFAIL WSEL FAILED
10. 1.00 1088.90 3.00 1095.00 1096.30
STATION WAL . PLAN 3, RATIO 1

BEGIN DAM FAILURE AT 40.17 HOURS
PEAK OUTFLOW IS 1495. AT TIME 43.17 HOURS

DAM BREACH DATA
BRWD 2 ELBM TFAIL WSEL FAILED
150. 12.00 1088.90 3.00 1095.00 1096.30
STATION WAL . PLAN 4, RATIO 1

BEGIN DAM FAILURE AT 40.17 HOURS
PEAK OUTFLOW IS 3356. AT TIME 42.17 HOURS

DAM BREACH DATA
BRWD 2 ELBM TFAIL WSEL FAILED
30. 2.00 1088.90 1.00 1095.00 1096.30
STATION WAL . PLAN 5, RATIO 1

BEGIN DAM FAILURE AT 40.17 HOURS
PEAK OUTFLOW IS 2874. AT TIME 41.17 HOURS

SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-31-80 PROJ. NO. 80-238-407
 CHKD. BY DJS DATE 1-2-81 SHEET NO. 0 OF 5



THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .010 HOURS DURING BREACH FORMATION. DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS. THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH. INTERMEDIATE FLUENS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	COMPUTED BREACH HYDROGRAPH (CFS)	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
40.167	0.000	242.	242.	0.	0.	0.
40.176	.010	366.	284.	83.	83.	0.
40.186	.020	491.	344.	147.	229.	0.
40.196	.030	616.	419.	197.	426.	0.
40.206	.040	740.	505.	235.	662.	1.
40.216	.049	865.	602.	263.	924.	1.
40.225	.052	990.	709.	281.	1205.	1.
40.235	.069	1114.	825.	290.	1495.	1.
40.245	.078	1239.	949.	290.	1785.	1.
40.255	.088	1364.	1081.	283.	2068.	2.
40.265	.098	1488.	1220.	269.	2336.	2.
40.275	.108	1613.	1365.	247.	2584.	2.
40.284	.118	1737.	1519.	220.	2804.	2.
40.294	.127	1862.	1676.	186.	2990.	2.
40.304	.137	1987.	1840.	147.	3137.	3.
40.314	.147	2111.	2008.	103.	3240.	3.
40.324	.157	2236.	2182.	54.	3294.	3.
40.333	.167	2361.	2361.	-0.	3294.	3.
40.343	.176	2561.	2543.	18.	3312.	3.
40.353	.186	2762.	2729.	32.	3344.	3.
40.363	.196	2962.	2919.	43.	3387.	3.
40.373	.206	3162.	3112.	51.	3438.	3.
40.382	.216	3363.	3307.	56.	3494.	3.
40.392	.225	3564.	3505.	58.	3552.	3.
40.402	.235	3764.	3706.	58.	3611.	3.
40.412	.245	3965.	3908.	57.	3667.	3.
40.422	.255	4165.	4112.	53.	3721.	3.
40.431	.265	4365.	4317.	49.	3769.	3.
40.441	.275	4566.	4523.	43.	3812.	3.
40.451	.284	4767.	4730.	36.	3848.	3.
40.461	.294	4967.	4918.	29.	3878.	3.
40.471	.304	5168.	5146.	22.	3899.	3.
40.480	.314	5368.	5354.	14.	3914.	3.
40.490	.324	5569.	5562.	7.	3921.	3.
40.500	.333	5769.	5769.	-0.	3921.	3.
40.510	.343	5964.	5975.	-12.	3909.	3.
40.520	.353	6159.	6182.	-23.	3885.	3.
40.529	.363	6354.	6387.	-34.	3851.	3.
40.539	.373	6548.	6591.	-43.	3808.	3.
40.549	.382	6743.	6794.	-51.	3758.	3.
40.559	.392	6938.	6995.	-57.	3700.	3.
40.569	.407	7133.	7195.	-62.	3638.	3.
40.578	.412	7327.	7392.	-65.	3573.	3.
40.588	.427	7522.	7589.	-66.	3507.	3.
40.598	.431	7717.	7783.	-66.	3441.	3.
40.608	.441	7912.	7975.	-64.	3377.	3.
40.618	.451	8106.	8166.	-59.	3318.	3.
40.627	.461	8301.	8354.	-53.	3265.	3.
40.637	.471	8496.	8542.	-46.	3219.	3.
40.647	.480	8691.	8724.	-38.	3181.	3.
40.657	.490	8885.	8909.	-24.	3156.	3.
40.667	.500	9080.	9080.	-0.	3156.	3.

PLAN

(2)

WILD ACRES

LAKE DAM

SUBJECT DAM SAFETY INSPECTION

WILD ACRES LAKE DAM

BY WJV

DATE 12-31-90

PROJ. NO. 90-238-407

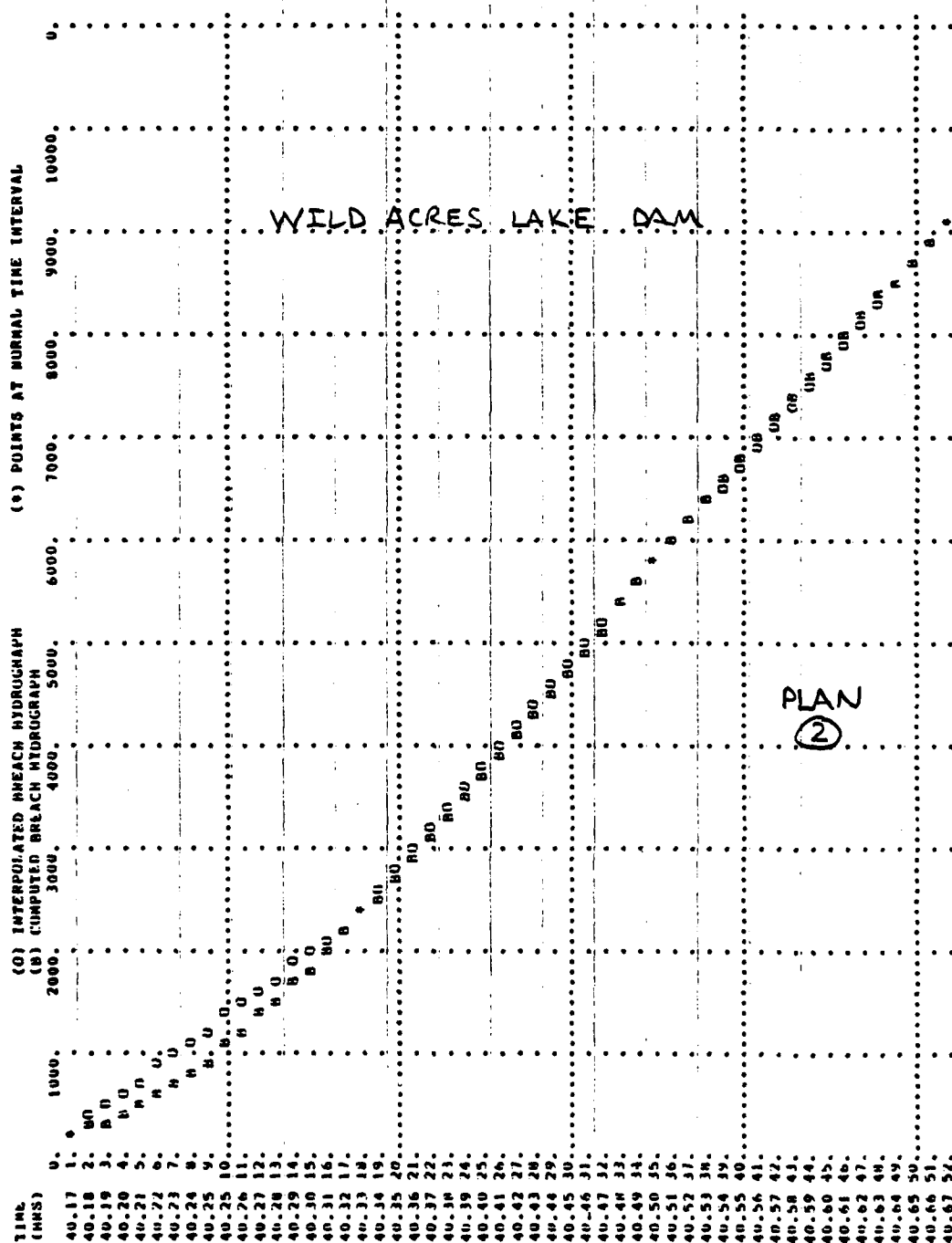
CHKD. BY RJS

DATE 1-2-91

SHEET NO. P OF S



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SUBJECT DAM SAFETY INSPECTIONWILD ACRES LAKE DAMBY WJV DATE 12-31-90 PROJ. NO. 80-239-407CHKD. BY DJS DATE 1-2-91 SHEET NO. Q OF SEngineers • Geologists • Planners
Environmental Specialists

THE DAM BREACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .021 HOURS DURING BREACH FORMATION.
DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED BREACH HYDROGRAPH.
INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF BREACH (HOURS)	INTERPOLATED BREACH HYDROGRAPH (CFS)	COMPUTED BREACH HYDROGRAPH (CFS)	EMKOK ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (AC-FT)
40.167	0.000	234.	234.	0.	0.	0.
40.188	.021	258.	246.	12.	12.	0.
40.208	.042	282.	263.	19.	30.	0.
40.229	.063	305.	284.	22.	51.	0.
40.250	.083	329.	307.	22.	74.	0.
40.271	.104	353.	332.	20.	94.	0.
40.292	.125	376.	361.	16.	109.	0.
40.313	.146	400.	391.	9.	118.	0.
40.333	.167	423.	423.	0.	118.	0.
40.354	.188	446.	459.	6.	124.	0.
40.375	.208	505.	494.	10.	135.	0.
40.396	.229	545.	533.	13.	147.	0.
40.417	.250	586.	573.	13.	161.	0.
40.438	.271	627.	614.	12.	173.	0.
40.458	.292	667.	657.	10.	183.	0.
40.479	.313	709.	702.	6.	189.	0.
40.500	.333	749.	749.	0.	189.	0.
40.521	.354	801.	796.	4.	193.	0.
40.542	.375	853.	845.	7.	200.	0.
40.563	.396	905.	896.	9.	209.	0.
40.583	.417	957.	947.	10.	219.	0.
40.604	.437	1009.	1000.	9.	228.	0.
40.625	.458	1061.	1054.	7.	235.	0.
40.646	.479	1113.	1109.	4.	239.	0.
40.667	.500	1165.	1165.	0.	239.	0.
40.688	.521	1227.	1222.	5.	244.	0.
40.708	.542	1289.	1281.	8.	252.	0.
40.729	.562	1352.	1341.	11.	263.	0.
40.750	.583	1416.	1403.	11.	274.	0.
40.771	.604	1478.	1466.	12.	284.	0.
40.792	.625	1538.	1530.	8.	293.	1.
40.813	.646	1601.	1596.	5.	298.	1.
40.833	.667	1663.	1663.	0.	298.	1.
40.854	.687	1725.	1721.	4.	302.	1.
40.875	.708	1808.	1801.	7.	309.	1.
40.896	.729	1880.	1872.	8.	317.	1.
40.917	.750	1953.	1944.	9.	326.	1.
40.938	.771	2025.	2017.	8.	334.	1.
40.958	.792	2098.	2091.	7.	341.	1.
40.979	.812	2170.	2166.	4.	345.	1.
41.000	.833	2243.	2243.	0.	345.	1.
41.021	.854	2322.	2320.	2.	347.	1.
41.042	.875	2401.	2398.	3.	350.	1.
41.063	.896	2480.	2476.	4.	354.	1.
41.083	.917	2559.	2555.	4.	357.	1.
41.104	.937	2637.	2634.	3.	361.	1.
41.125	.958	2716.	2714.	2.	364.	1.
41.146	.979	2795.	2794.	1.	365.	1.
41.167	1.000	2874.	2874.	0.	365.	1.

PLAN

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WILD ACRES

LAKE DAM

SUBJECT DAM SAFETY INSPECTION

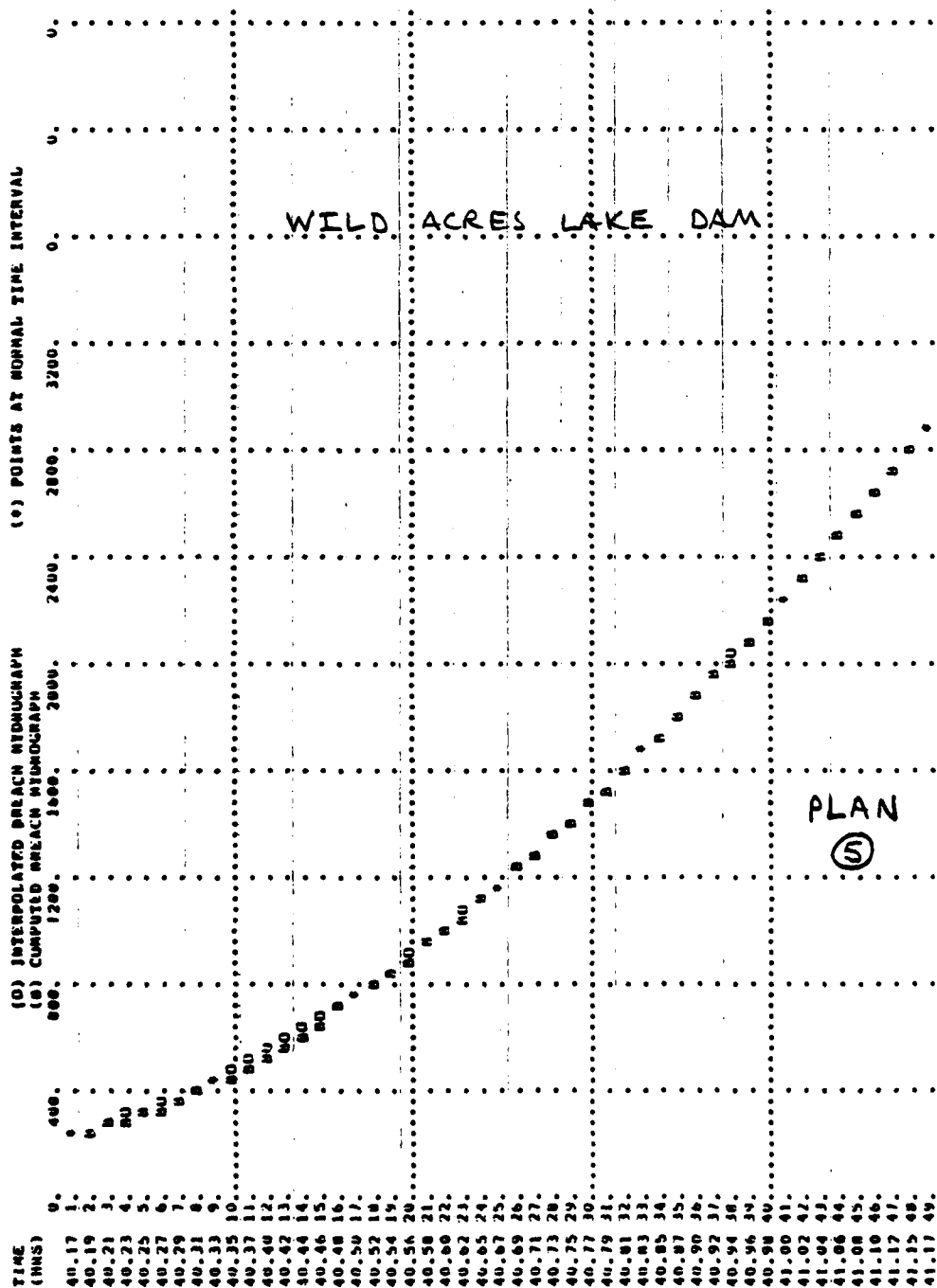
WILD ACRES LAKE DAM

BY WJV DATE 12-31-80 PROJ. NO. 80-238-407

CHKD. BY DJS DATE 1-2-81 SHEET NO. R OF S



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SUBJECT DAM SAFETY INSPECTION
WILD ACRES LAKE DAM
 BY WJV DATE 12-31-90 PROJ. NO. 80-238-407
 CHKD. BY WJS DATE 1-2-81 SHEET NO. 5 OF 5



Engineers • Geologists • Planners
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SUMMARY OF DAM SAFETY ANALYSIS

		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM				
	ELEVATION	1142.00	1142.00	1144.70				
	STORAGE	19.	19.	39.				
	OUTFLOW	0.	0.	220.				
PLAN	RATIO OF PMF	MAXIMUM RESERVOIR U.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.25	1144.84	.14	40.	1610.	.33	41.17	40.67
2	.25	1144.81	.11	40.	2212.	.22	40.87	40.67
3	.25	1144.91	.21	41.	491.	.78	42.56	40.67
4	.25	1144.87	.12	40.	656.	.33	41.17	40.67
5	.25	1144.83	.13	40.	1146.	.31	41.23	40.67
"NON-BREACH"	.25	1145.02	.32	42.	283.	2.33	41.33	0.00

SOUTH
POND
DAM

SUMMARY OF DAM SAFETY ANALYSIS

		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM				
	ELEVATION	1225.00	1225.00	1227.00				
	STORAGE	80.	80.	112.				
	OUTFLOW	0.	0.	240.				
ALL PLANS	RATIO OF PMF	MAXIMUM RESERVOIR U.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	.25	1227.02	.92	112.	244.	.67	42.17	9.00

NORTH
POND
DAM

SUMMARY OF DAM SAFETY ANALYSIS

		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM				
	ELEVATION	1095.00	1095.00	1096.30				
	STORAGE	167.	167.	276.				
	OUTFLOW	0.	0.	213.				
PLAN	RATIO OF PMF	MAXIMUM RESERVOIR U.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1	.25	1096.81	.51	320.	1512.	2.83	41.33	40.17
2	.25	1096.48	.18	285.	988.	.36	40.67	40.17
3	.25	1097.11	.81	346.	1495.	3.83	43.17	40.17
4	.25	1096.55	.25	297.	3356.	1.17	42.17	40.17
5	.25	1096.57	.27	299.	2874.	1.25	41.17	40.17
"NON-BREACH"	.25	1097.23	.93	356.	962.	8.00	42.33	0.00

WILD
ACRES
LAKE
DAM

STATION 101				STATION 102			
RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS	PLAN	RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT
.25	1454.	955.6	41.67	1	.25	1452.	897.8
.25	6677.	960.0	40.83	2	.25	5553.	901.8
.25	1465.	955.7	43.17	3	.25	1463.	897.8
.25	3282.	957.8	42.33	4	.25	3203.	900.5
.25	2576.	957.1	41.50	5	.25	2548.	900.0
.25	951.	954.8	42.67	"NON-BREACH"	.25	950.	896.6

SECTION 1

SECTION 2

LIST OF REFERENCES

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APPENDIX E

FIGURES

LIST OF FIGURES

<u>Figure</u>	<u>Description/Title</u>
1	Regional Vicinity and Watershed Boundary Map
2	Plan and Cross-Sections

LAKE MASKENOZHA, PA.—N. J.
NW/4 DINGMANS FERRY 15' QUADRANGLE
N4107.5—W7452.5/7.5

1954
PHOTOREVISED 1963 AND 1973
AMS 6066 III NW—SERIES V831

--- LONGEST WATERCOURSE
o CENTROID OF DRAINAGE AREA

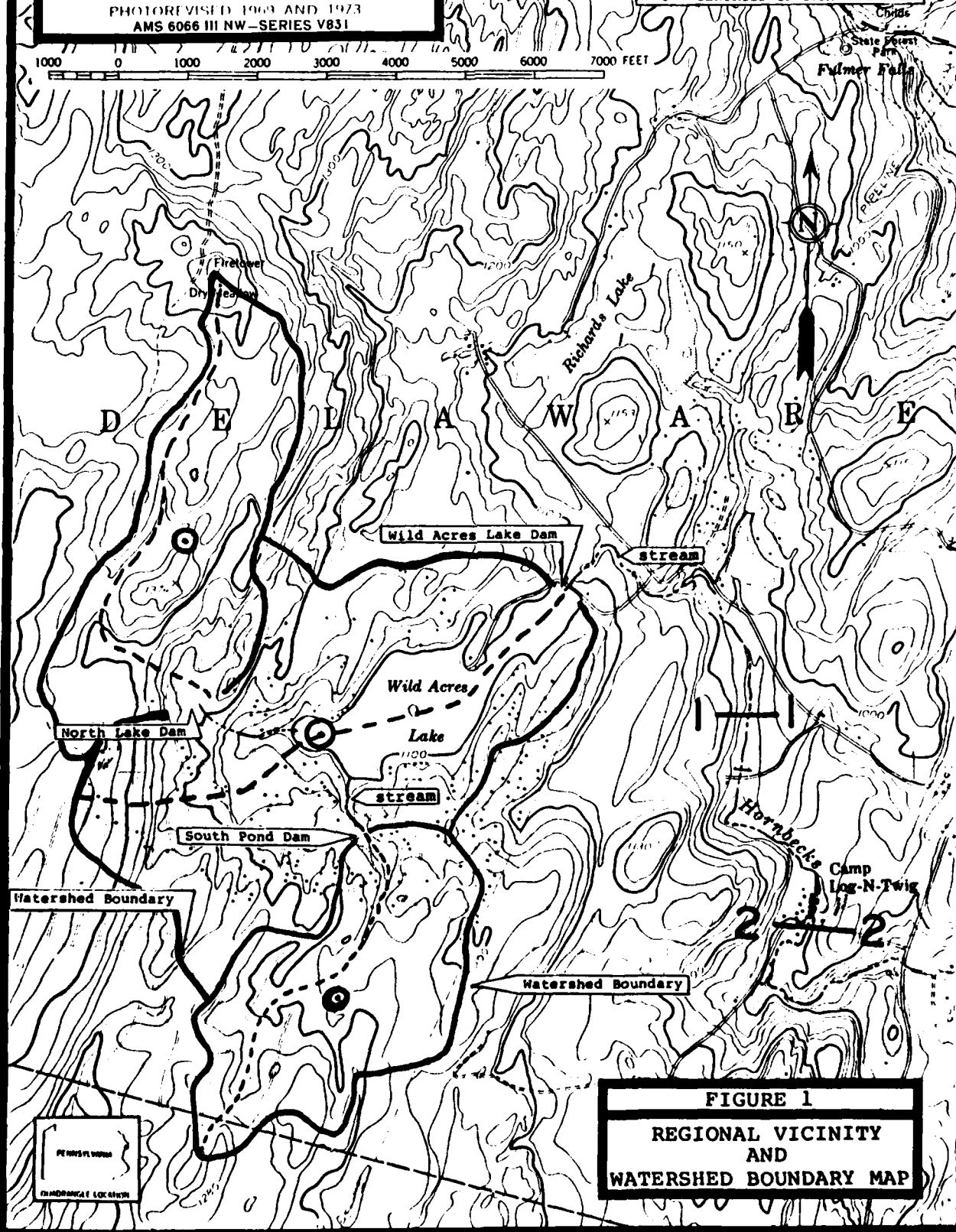


FIGURE 1
REGIONAL VICINITY
AND
WATERSHED BOUNDARY MAP

APPENDIX F

GEOLOGY

Geology

Wild Acres Lake Dam is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of eastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Pike County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing Pike County lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably members of the Susquehanna Group of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation indicate that the rate of sedimentation exceeded the rate of basin subsidence resulting in a facies change from marine to non-marine strata. On the accompanying geology map the delineation between the Middle and Upper Devonian age sedimentary rock sequences represents the Allegheny Front which separates the Valley and Ridge physiographic province from the Appalachian Plateaus physiographic province.

Approximately half of Pike County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance, was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County which borders Pike County to the South.

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NATIONAL DAM INSPECTION PROGRAM. WILD ACRES LAKE DAM (NDI I.D. --ETC(U)

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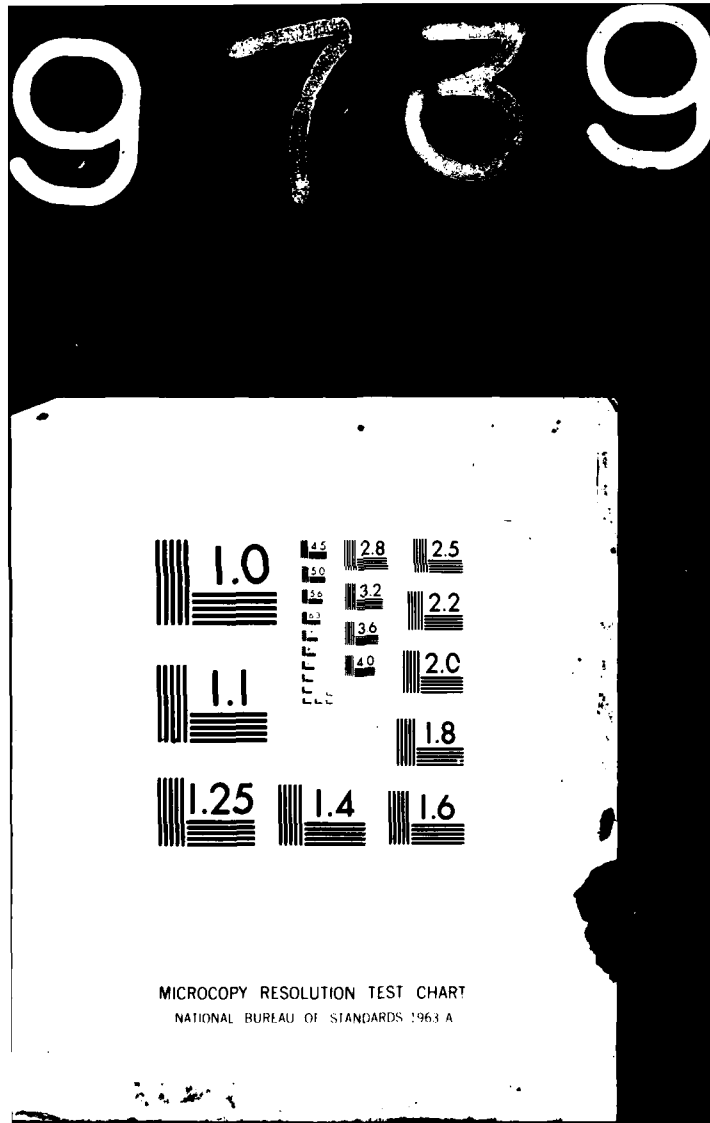
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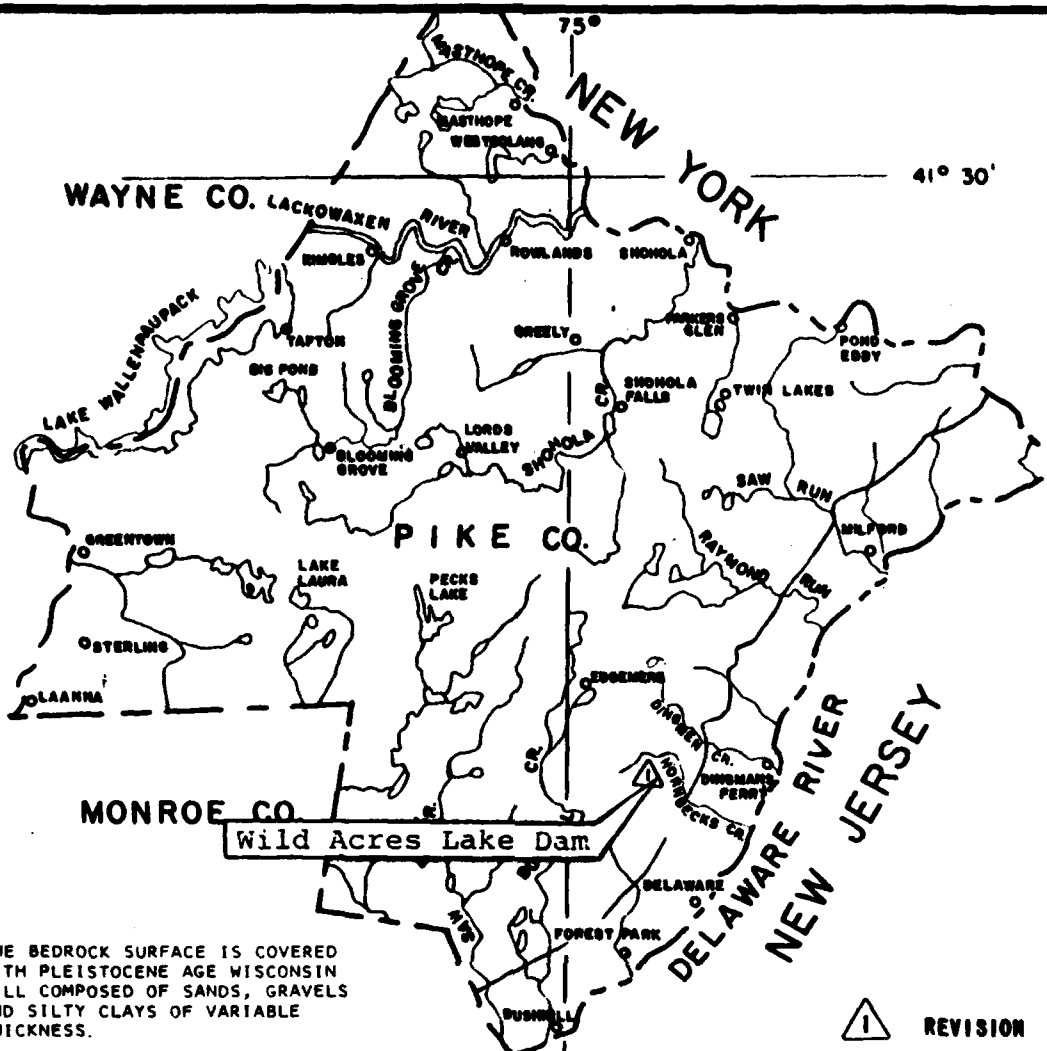
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LEGEND

UPPER DEVONIAN



SUSQUEHANNA GROUP

Catskill Formation - Shohola Member interbedded 5- to 25-foot thick units of greenish-gray and grayish-red very fine to medium-grained sandstone and sandy shale and lesser medium-gray to medium-dark-gray sandstone and shale. Sandstones are predominantly low-rank graywackes. Beds are thin to very thick and most have simple or planar sets of small- to medium-scale, generally low-angle cross stratification. Contacts with shale units are abruptly disconformable to gradational. Sandstones are poorly cleaved. Shale is thinly laminated and well cleaved. Mud cracks, convolute bedding, and sole marks are present near contacts with sandstone units. Member is more than 2,000 feet thick. Lower contact is gradational and is placed at top of highest red bed of the underlying Anaconink. Anaconink Fm Shale Member, medium-grayish red silty, micaceous, finely laminated well-cleaved shale containing thin beds of brownish-gray sandy siltstone and silty very fine grained sandstone. Unit is the "first red" going up section in Upper Devonian sequence. Member is about 100 feet thick. Lower contact is gradational and is placed at the base of lowest red bed. Delaware River Flags Member, grayish-green, micaceous, laminated sandstone and lesser interbedded sandy shale. Beds range from a few inches to as much as 4 feet thick. Sandstones are low-rank graywackes and contain no marine fossils. Member is about 300 feet thick. Lower contact is gradational.

MIDDLE DEVONIAN



HAMILTON GROUP

Mahantango Formation - Upper member medium-dark-gray, fairly coarse grained, thin-bedded siltstone and silty shale; member is about 700 feet thick and is separated from lower member by the "Centerfield Reef," a calcareous siltstone biontreme containing abundant horn corals. The Centerfield is about 25 feet thick. Lower member, virtually same lithology as upper member. Unit is about 1,100 feet thick. Lower contact is gradational.

Marcellus Shale - Dark-gray, evenly laminated, silty clay shale and clayey silt shale. Unit commonly contains very hard limy concretions and is well cleaved; bedding is generally obscured. Member is about 75-feet thick. Lower contact is gradational.

SCALE



REFERENCE:

GEOLOGIC MAP OF NORTHEASTERN PENNSYLVANIA. COMPILED BY GEO. W. STOSE AND O.A. LJUNGSTEDT COMMONWEALTH OF PENNSYLVANIA DEPT. OF INTERNAL AFFAIRS DATED 1932, SCALE 1" = 6 MILES.

GEOLOGY MAP



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